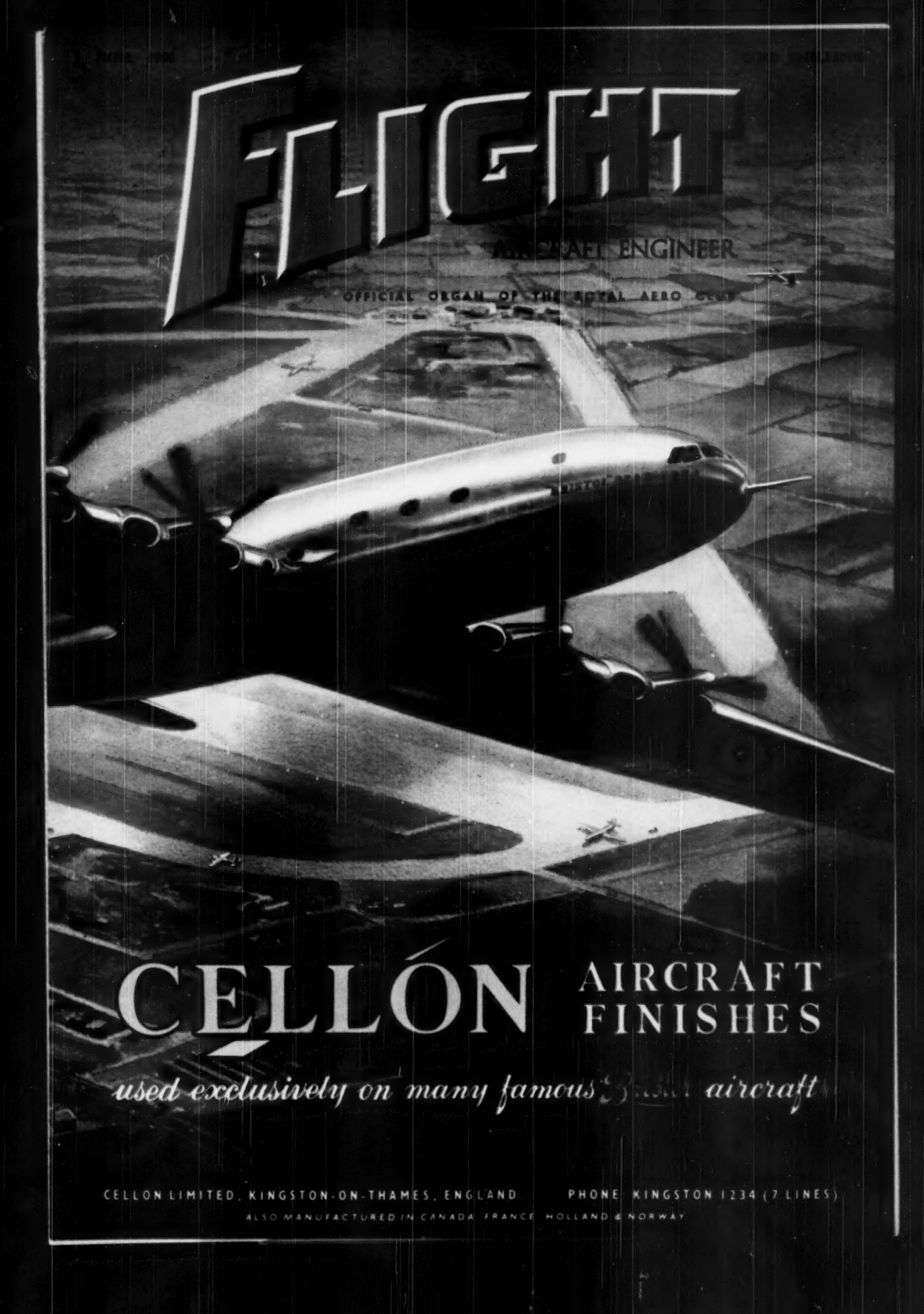

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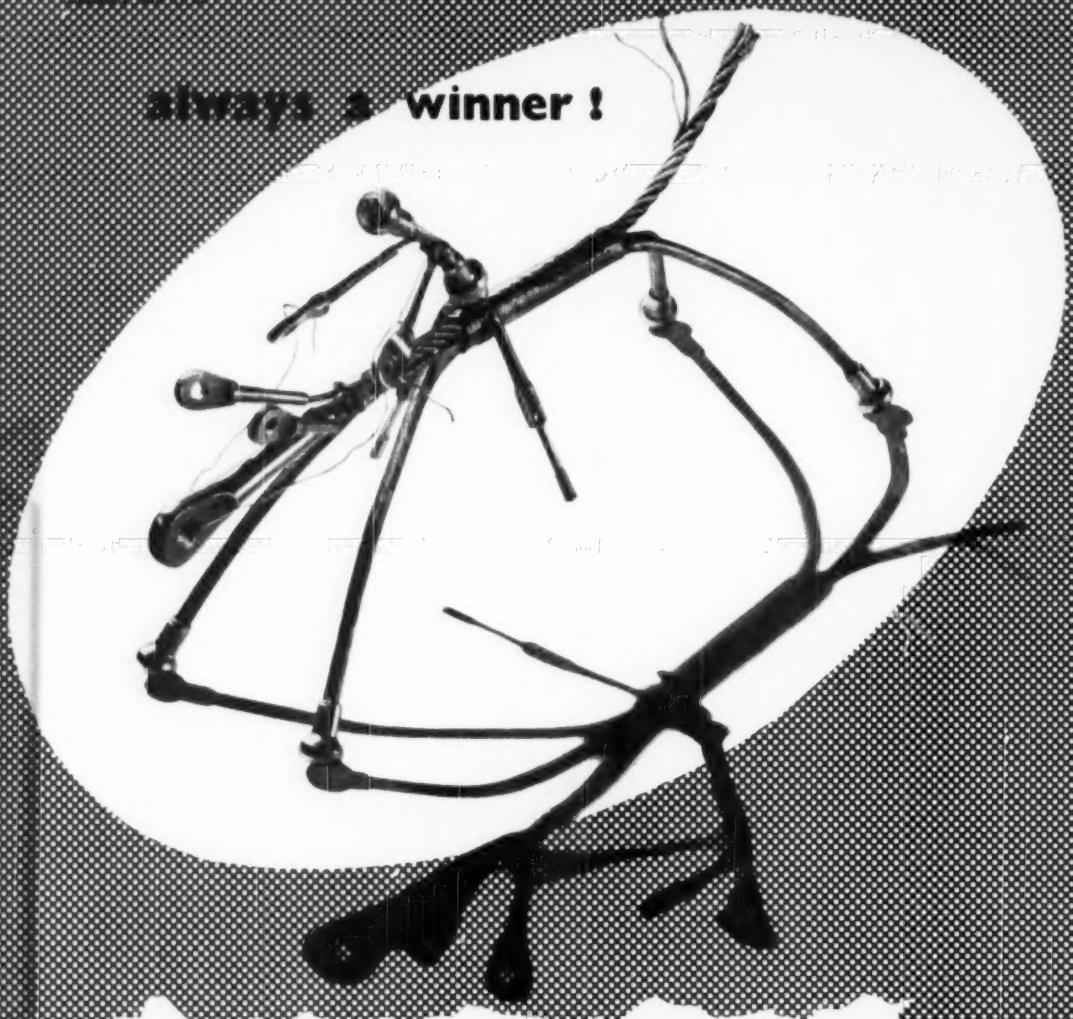

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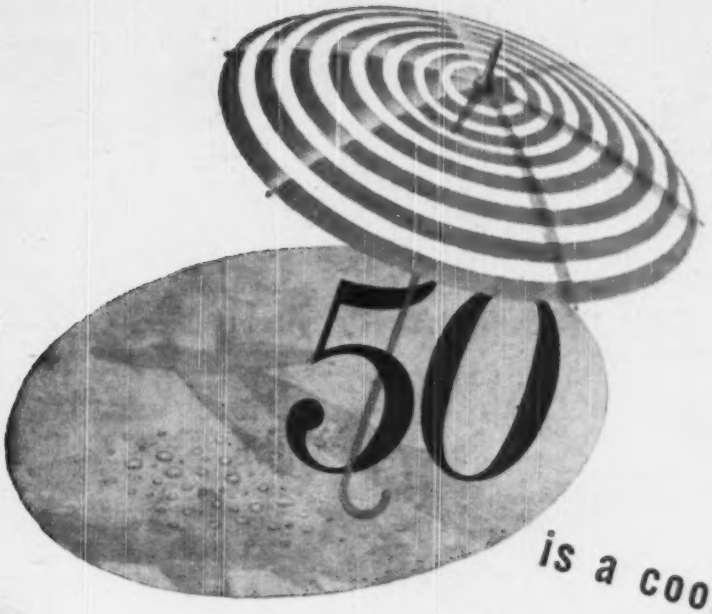

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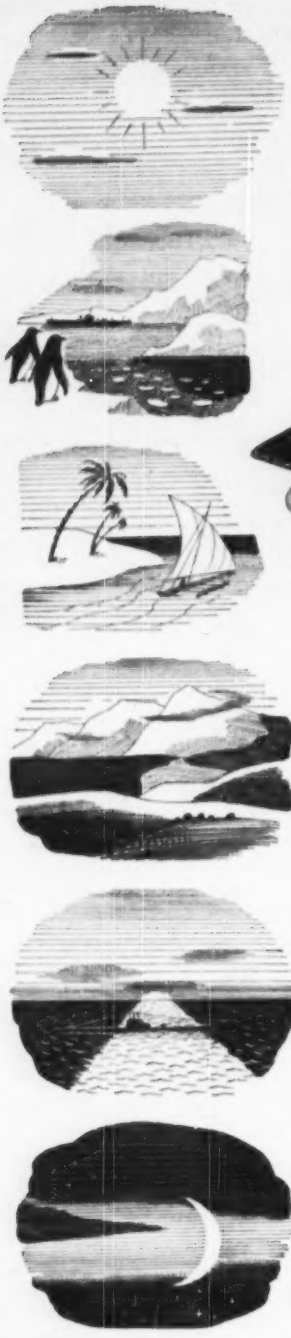

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Founded 1909

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A Plea for Posterity

A FEW days ago we received a request from a large and famous aircraft manufacturing firm for information on one of its products—a more frequent occurrence than might be believed. Though the type dated from only twenty years ago, the most diligent research failed to disclose any of the required particulars. *Flight* had never described the machine (doubtless because of security restrictions pertaining while it was of current interest), and the most dependable works of reference failed even to mention its existence. Already it had sunk deep into the limbo of unadopted prototypes.

This was the more regrettable as the firm concerned has, to our knowledge been at greater pains than most others in preserving records of its aircraft types. Like those of other companies, however, its archivists are finding that their information is by no means complete ; not, be it said, in any vital connection, but concerning particularly some of the lesser known (though not necessarily less interesting) designs.

With more than forty years of activity already behind it, the Industry, it is clear, should now lose no time in ensuring that its annals are complete and well preserved for the use of students, historians and others. The bound volumes of *Flight*—now occupying some 25ft of shelf-space—constitute, in our own humble estimation, the fullest record of British aeronautical achievement now available ; but, as already exemplified, even this impressive accumulation of knowledge is necessarily incomplete in certain minor respects.

Interest in old aircraft increases year by year, and we in Britain are much indebted to the trustees of the Shuttleworth Collection, who maintain a little fleet of veteran types for our delight and edification. But there are many historic aircraft which—except, perhaps, in replica—will never take the air again. Fortunately, with admirable foresight, most manufacturers, the Services, and such national institutions as the Science Museum, have built up some remarkable collections of accurate, super-detailed scale models. When brought together (as many of them were at the Garden Party this month) these comprise an extremely valuable and authentic record of design progress, supplementing and illustrating the written word.

What is now required is an effort to consolidate and complete existing records of the various makers, and then to ensure, by means of documentation, pictures, models or actual specimens, that students of aeronautical history shall be enabled to pursue their work or hobby with greater facility and assurance than is at present possible.

Welcome, Mr. White !

IT was fitting that, as described overleaf, the Australian Minister for Air and Civil Aviation, the Hon. T. W. White, should have been enabled to see types of aircraft of which we in Britain are especially proud and in which he himself is most directly interested. He is a practical, astute personality, with manifold responsibilities of concern to the British aircraft industry, and we believe that the industry and Ministry of Supply together have spared no effort to satisfy his enquiring mind. The only regrettable circumstance attending the Minister's visit appears to have been a minor defect which prevented his flying in the English Electric Canberra jet bomber. This, we believe, he would have found an incomparable, exhilarating experience, and one of special interest to himself, as the Canberra is to be built in his own country. All the types displayed for Mr. White's benefit have obvious Australian applications, but, as he himself is fully aware, Britain has much more to offer. The Marathon, for instance, has already been demonstrated "down under," and the Blackburn and General Aircraft Universal Freighter, soon to take the air, seems ideally suitable for Commonwealth service.

In the past a certain indifference to Australian requirements has been discernible in the industry, but this is less apparent to-day, and there is good reason to hope that before long some of the finest types of British aircraft will be registered "VH," or bear the roundels of the Royal Australian Air Force.

FRIEND FROM AUSTRALIA

The Australian Minister for Air and Civil Aviation Broadens His Knowledge of British Aircraft and Shows a Film

WITH the comings and goings of politicians, whether they be of the British Commonwealth or of foreign countries, this journal does not ordinarily concern itself unless their politics have some bearing on aviation. Even then it is to the policy rather than to the man that we direct our attention, for these shapers of national destinies too seldom display a personality calculated to inspire the journalistic pen.

But Mr. T. W. White, Australia's Minister for Air and Civil Aviation, who has just spent a fortnight in this country, is one of the exceptions. In the first place, he was a fighter pilot (with a D.F.C.) in the First World War; in the second, and perhaps as a corollary to the first, he has a practical and astute outlook on aviation matters; and in the third he is—as we can affirm from personal contact—an essentially friendly person, entirely free from political pomposity.

His brief stay in England—actually only a "stop-over" on his way to Montreal for the I.C.A.O. Conference—was a strenuous one, for he made it his business to see some of the Service and civil aircraft in which Australia is particularly interested. At Farnborough on Tuesday of last week four types were specially demonstrated for him—the Hawker P.1052 (a development of which is to be built in Australia), the Canberra (likewise to be Australian-built), the Comet and the Hermes IV. In the Comet he had an hour's flight with John Cunningham and after the show S/L. H. G. Hazelden ferried him to Radlett, on his way back to London, in the Hermes, with Sir Frederick Handley Page as a fellow-passenger. Later he told us that, notwithstanding all he already had heard and read of these two new civil types, he was amazed by the comfort they offered.

He was to have had what might have been a less luxurious but certainly no less interesting ride in the Canberra, but a minor fault in the ejector-seat mechanism, just before take-off, could not be rectified in time.

Sampling the Hermes: The Australian Air Minister is with Sir Frederick Handley Page; then, reading upwards on the steps, are Major R. E. Nicoll, H.P. sales manager; A.Cdre. E. G. Knox-Knight, commanding R.A.A.F. overseas; W/C. R. M. Power, the Air Minister's personal assistant; Mr. F. Beswick, M.P., Parliamentary Secretary, M.C.A.; and A.Cdre. S. Graham, sales manager, English Electric Co., Ltd.

In addition, on other days he visited Filton (where he flew in the Bristol 171 helicopter and inspected the Brabazon I) and the factories of de Havilland, English Electric, Westland, Handley Page, Hawker, Vickers (here he inspected the Viscount) and Rolls-Royce. He was also to visit Horsham St. Faith last Friday.

Though diplomatically refusing to be "drawn" on the subject of nationalization in countries outside his own, Mr. White had some interesting things to say regarding the present civil aviation set-up in Australia, where the Federal Government are now busy loosening some of the bonds tied by their socialist predecessors in office. The government-owned Trans-Australia Airlines, who have been losing money, have been told "to get on a business footing": the interim policy is to be one of "regulated competition" between national and private enterprise with a view to increased operating efficiency and the maintenance of low fares. As readers of our "Civil Aviation News" in past months will be aware, the Australian Department of Civil Aviation is now going ahead with a big programme of navigational and landing aids.

The previous rigid ban on operations by charter concerns from other countries is to be relaxed, but, emphasized Mr. White, proof would be required that any proposed flights would be made only by responsible operators on safe, properly organized lines.

On the question of flying equipment, he said that though Australia had a dollar problem, and though it had been the policy since 1908

About to board the Comet: Mr. White and A.Cdre. Knight; with them (left) is W/C. Power.

to give preference to British goods, it might happen in some cases that America, and America alone, could offer a type of aircraft fitted for some specific need; when that happened, dollars would have to be found. (To our mind, this is a strong recommendation to British constructors to be keenly alert to Australian requirements.)

Private and club flying, added Mr. White, was not enjoyed on a large scale in Australia, perhaps by reason of the counter-attractions of frequent airline services and low fares and because of a dearth of inexpensive light aircraft; but he recognized its value, and was taking steps to simplify present requirements such as the filing of flight-plans by private pilots. Incidentally, in the Federal Parliament there were 15 ex-members of the Air Force, and half-a-dozen of these were private owners of aircraft.

On the subject of Service aviation, Mr. White said that Australia, too, had her recruiting problems. In the past, only unmarried men had been recruited in peace-time, but now the R.A.A.F. was open to married men as well; there, again as in England, the provision of married quarters was proving a bottleneck, but steps were being taken to overcome the difficulty—a commission was investigating the possibility of importing large quantities of pre-fabricated buildings from this country.

A reception by Mr. White, at Australia House on May 22nd, was attended by many of the most prominent figures in British aviation and by some of the most senior R.A.F. officers. Occasion was taken to show an edifying 30-minute film—*Flight Plan*—made by the Australian National Film Board in co-operation with the Civil Aviation Department. This admirable documentary really brought home to the British guests the scale and efficiency of Australia's air system, and the way in which aircraft are changing the way of life of those stalwarts living "out-back." The flying-doctor service (the word service is here used in its highest humanitarian sense) is exemplified, and there is a particularly choice sequence when an airline pilot, waiting to take off from Mascot airfield, is instructed by Control to keep his Dakota off the runway while a similar machine makes a single-engined landing and others are brought in after it. Never has that picturesque expletive "stone the crows!" been uttered with more feeling and in better Australian.

Helicopter experience: The Australian Air Minister with Sir G. Stanley White, Bristol's managing director, before a flight in the Bristol 171 helicopter, powered with an Alvis Leonides.

The new film was preceded by Mr. William Courtenay's little classic showing the Royal Australian Air Force in action against Balik Papan, in Borneo, and the subsequent amphibious invasion.

R.Ae.S. Medals and Awards

AT the annual Wilbur Wright Memorial Lecture it is the custom to distribute the medals and awards of the Royal Aeronautical Society. The 1949-50 presentations were duly made at the Royal Institution last Thursday evening before Sir Richard Fairey's lecture (reported on pp. 673-675 of this issue), the recipients being as follows:—

British Gold Medal for Practical Achievement in Aeronautics.—Maj. F. B. Halford, for his work in the design and development of power plants.

British Silver Medal for Practical Achievement in Aeronautics.—G/C. P. W. S. Bulman and Capt. Summers, for their long and distinguished work in flight-testing.

George Taylor (of Australia) Gold Medal (for the most valuable paper read during the previous session).—Mr. E. J. Richards, for his paper on "A Review of Aerodynamic Cleanness."

Edward Busk Memorial Prize (for the most valuable contribution on applied aerodynamics).—Mr. D. L. Ellis, for his paper on "Industrial Wind Tunnels."

Usborne Prize (for the best contribution to the Society's publications written by a graduate or student).—Mr. C. M. Britland, for his paper on "Helicopter Hovering Performance."

Simms Gold Medal (for the most valuable contribution on any subject allied to aeronautics).—Dr. D. E. Adams and Dr. A. N. Uttley, for a paper on "Navigational Systems and Instrument Aids."

Pilcher Memorial Prize (for the most valuable paper read by a graduate or student during the previous year at any meeting of the Society or of its Branches).—Mr. J. Hahn, for his paper on "Training of Aeronautical Engineers."

Orville Wright Prize (for the best contribution received for publication in the *Aeronautical Quarterly* of the Society).—Mr. G. W. Trevelyan and Mr. D. R. Blundell, for their paper on "Determination of the Drag of Jet-propelled Aircraft in Flight."

Branch Prize (for the best paper read before the Branches during the previous lecture session).—W/C. E. A. Harrop, for his paper on "Planned Servicing in the R.A.F." before the Brough Branch.

The Society's Gold Medal (the highest honour which the Society can confer for work of an outstanding nature in aeronautics).—Sir Geoffrey de Havilland, for his work in the field of aviation.

The Society's Silver Medal (for work of an outstanding nature in aeronautics).—Mr. W. E. Petter, for his work on the design of high-performance aircraft; Mr. J. Smith, of Vickers Supermarine, for his work on the design and development of high-performance R.A.F. and naval aircraft.

The Society's Bronze Medal (for work leading to an advance in aeronautics).—Mr. A. C. Lovesey, for his contributions to engine development.

R. P. Alston Memorial Prize (for practical achievement associated with the flight-testing of aircraft).—Mr. P. Goodman, for his valuable and careful work as a flight observer.

During the ceremony, Honorary Fellowships (listed in *Flight* last week) were also presented. Sir Francis McClean and Mr. T. O. M. Sopwith receive theirs from Maj. G. P. Bulman, the new president; on the right, Air Marshal Sir Alec Coryton receives his Honorary Companionship.

"*Flight*" photographs.

HERE and THERE

Exports and Imports

EXPORTS of British aircraft, engines and accessories during April showed a slight drop in comparison with March; they totalled £3,319,187, as against £3,429,985. Import figures also fell, from £2,188,388 in March to £1,380,934 in April.

Neptune's New Power Units

INCREASED endurance, more power and less engine noise are stated to result from the installation of Wright Cyclone 18 "compound" engines in the Lockheed P2V-4 Neptune anti-submarine aircraft. The first Neptune to have the new engines is now being flight-tested.

The Wright compound engine employs three turbines to convert energy from the exhaust gases and feed back power to the crankshaft. The unit is based on the Wright R-3350 engine and gives an output of 3,250 h.p.

Mr. F. A. Tichenor

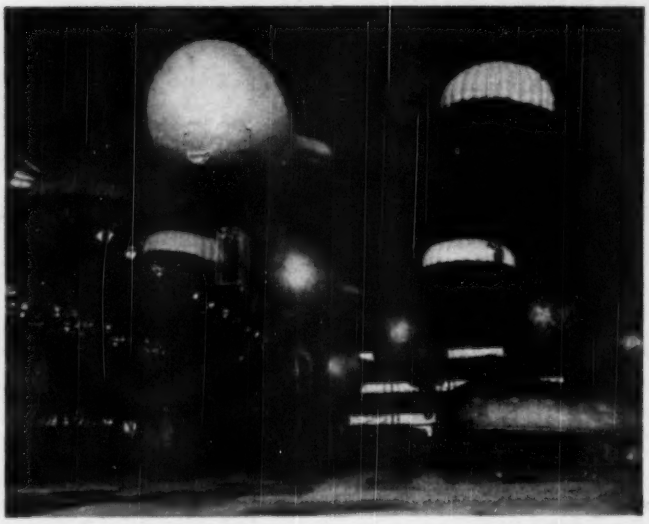
WE much regret to learn of the death of Frank A. Tichenor, Editor and publisher of *Aero Digest* (New York). Mr. Tichenor, in his seventieth year, passed away suddenly at Greenwich, Conn.

S.B.A.C. Race Entries

THE 100-km closed-circuit record may well be broken in this year's S.B.A.C. Race (Leeds, July 22nd), for which entries are as follows:— Bill Waterton, Meteor; Mike Lithgow, Attacker I; John Derry, Venom; Trevor Wade, Hawker jet fighter. Three of the four pilots have held the 100-km record since the war.

Twenty Centuries

WHEN he set down a Seafire 17 on the deck of H.M.S. *Illustrious* on May 24th (as seen below), Lt. Cdr. J. S. Bailey, O.B.E., R.N., created what is thought to constitute a world's record for deck-landings. Lt. Cdr. Bailey joined the Fleet Air Arm in 1938, and began his operational career flying Albacores over the English Channel in 1941. His present appointment is Lt. Cdr. (Air) at Culham.



DRESS REHEARSAL: One of the most successful items in last year's Royal Tournament was the R.A.F. demonstration of parachute training. It will be repeated in this year's Tournament—to be held at Earls Court from June 7th-24th. Practice is seen in progress from the "ceiling" of one of the Cardington airship hangars.

THIS ISSUE OF "FLIGHT"

THE withdrawal of overtime working by a section of the printing industry which necessitated a slight reduction in the number of pages in *Flight* last week still operates. We regret, therefore, that to-day's issue is similarly affected.

Security and the Press

IN the House of Commons on May 22nd, Sir Peter Macdonald (Cons., Isle of Wight) asked the Minister of Supply (Mr. G. R. Strauss) whether there was any body or committee to scrutinize "the question of security in the issuing of information to technical papers such as *Flight*," on types of aircraft which have not yet been produced. The Minister replied that there was such a technical committee, on which the Services were fully represented. He added that care was taken not to give away information which was likely to be of value to a potential enemy.

It should be stressed, lest any criticism be inferred, that *Flight's* editorial policy is one of strict adherence to official security regulations.

Flying the Skyrocket

GENE MAY, the 47-year-old test pilot (and grandfather) who has for two years been in charge of the experimental Douglas Skyrocket flight-test programme, is reported to have logged over an hour's flying at speeds in excess of 800 m.p.h.

On take-off, the Skyrocket's wing-loading is 93 lb/sq ft; on landing, this is reduced to about 60 lb/sq ft. The aircraft lands at 160 m.p.h., and "in the pattern" it orbits at 300 m.p.h. At 40,000ft and above, the Skyrocket stalls at a true air-speed of 400 m.p.h. "When I get up to sonic speed," says May, "I lose the sound of the engine and rockets

NAVAL OCCASION: As reported on this page, Lt. Cdr. J. S. Bailey (above) has made his 2,000th deck-landing; on the left, his Seafire is shown about to touch down on H.M.S. *Illustrious*. He has deck-landed 19 types of aircraft.

30 years progress in power for aircraft
Thirty years ago, the prototype of the famous "Bristol" Jupiter air-cooled radial engine went on test, and delivered about 550 B.H.P. Today, its direct descendant, the mighty Centaurus, gives nearly 3,000 B.H.P. Behind these figures lies an epic story of achievement in technical evolution, in quality of manufacture, and in world-wide service.
Bristol aero-engines power the majority of British airliners in current production
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THE VICKERS VISCOUNT

(FOUR ROLLS-ROYCE DART PROPELLER TURBINES)

AT90R

AIR ATTACHÉS of several nations recently visited the Gloster Aircraft Company, and are seen above with Gloster officials. As indicated in the accompanying key, those present were :—

(1) Mr. S. Scotter, Gloster; (2) Maj. B. R. Ek, Finnish A.A.; (3) Cdr. H. Valentiner, Danish Asst. Nav. and A.A.; (4) Maj. E. Hagen, Norwegian A.A.; (5) Capt. A. Enver, Turkish Asst. A.A.; (6) Maj. Boustani, Lebanese Staff Officer; (7) Mr. Downing, Gloster; (8) Maj. Van der Wolf, Netherlands Asst. Mil. and A.A.; (9) Capt. R. Derimay, French Asst. A.A. (10) W/C. Mills, Air Ministry; (11) Mr. Greenwood, Gloster; (12) F/L. Plass, Air Ministry; (13) H/L. Dimitracopoulos, Greek Asst. A.A.; (14) Lt. Col. D.S. Panah, Italian A.A.; (15) W/C. Wilson-MacDonald, Air Ministry; (16) Capt. G. Bakas, Greek Nav. and A.A.; (17) Mr. Carse, Gloster; (18) Capt. S. F. Boomercli, Swedish Asst. A.A.; (19) Col. J. G. Rieser, Swiss Mil. and A.A.; (20) Col. Ghazi, Lebanese Staff Officer; (21) Capt. Massano, Italian Asst. A.A.; (22) F/L. Thinakorn, Thai Asst. A.A.; (23) Col. Hall, American Asst. A.A.; (24) Col. Bentancur, Uruguayan Mil. and A.A.

HERE AND THERE . . .

behind me. I can hear the ticking of the cockpit clock, the clicking of the instruments . . . my own breathing."

CF-100 on Show

AVRO Canada's CF-100 two-seat all-weather fighter was recently demonstrated before U.S.A.F. officials and several air attachés at Andrews Air Force Base, Washington, and created a very favourable impression. Piloted by S/L. Bill Waterton, with Michael Cooper-Slipper in the navigator's seat, the new fighter returned to Toronto in just over 43 minutes, an average speed of 565 m.p.h. According to a recent unconfirmed American report, the U.S.A.F. has placed an order for the CF-100, so that it may undertake evaluation trials with a view to its adoption as a standard night and all-weather fighter.

SERVICES CELEBRATE : In London on May 20th, an officers' dinner-dance was held to mark the first United States Armed Forces' Day. One of the guests was Air Marshal Sir Ralph Cochrane (left), the Vice-Chief of Air Staff. He is seen with Maj-Gen. Leon Johnson, who commands the U.S.A.F. Third Air Division in this country.

Royal Inspection

LAKENHEATH, Suffolk—one of three R.A.F. stations used by American bomber forces in this country—will be visited by the King and Queen on June 26th. Their Majesties, who made more than one visit to Eighth Air Force stations during the war, will inspect units of the Third Air Division, U.S.A.F.

French Farnborough

SEVERAL of the most important French prototypes will be exhibited at the 1950 French National Air Display, to be held at Orly on June 11th. In addition, there will be two races—one between jet fighters, the other between six Nord Norecrins—and jet aerobatics by teams from the R.A.F., U.S.A.F., Belgian and Netherlands Air Forces. During the display, 150 paratroops will be dropped on the airfield.

Official Confirmation

THE F.A.I. announces homologation of a number of records recently set up by British aircraft. One of the records, S/L. Neville Duke's flight from London to Cairo in a Hawker Fury, has since been captured by the Comet. The others, which still stand at the time of going to press, were set up by J. Zurakowski in a Gloster Meteor 8 (between London and Copenhagen) and J. Cunningham and P. Bugge in the D.H. Comet (between London and Rome).

Enter the Sylphe

AT the request of the Wright Aeronautical Corporation of America, the French Fouga concern has abandoned the name of Cyclone for its CM. 8-R.13 jet-powered sailplane, which will henceforth be known as the Sylphe. The names Cyclope and Gemaux have been adopted for other powered variants in the Fouga sailplane series. A new Turboméca jet unit, of 440-660 lb thrust, powers the Gemaux, which is a two-seater.

NEWS IN BRIEF

THE Institute of Transport announces the election of Mr. J. W. S. Brancker as one of its vice-presidents for 1950-51. Mr. Brancker is general manager (commercial) of B.O.A.C.

* * *

The Sperry Gyroscope Co. has produced a well illustrated brochure containing descriptions of the aircraft and marine navigation equipment which it is exhibiting at the Canadian International Trade Fair.

* * *

"These machine shops are all yours for accurate and efficient production of your own repetition parts" announces a folder issued by the Plessey Co., Ltd., Ilford, and illustrates the firm's repetition-production facilities.

* * *

The Bristol Aeroplane Company announces two new overseas appointments for members of its service organization: Mr. W. S. Haggett is to become senior representative at Montreal, and Mr. A. F. Beevers will be stationed at Karachi as the company's branch manager in Pakistan.

* * *

Mathew Brothers, Sandy Lane North, Wallington, Surrey, have produced a new type of fork truck which, being fitted with "giant" pneumatic tyres, is stated to be as suitable for use on unmade outdoor surfaces as it is on factory floors. These "Matbro" trucks will be seen at the Mechanical Handling Exhibition, Olympia, June 6th-17th.

* * *

A brochure from Engineering Components, Ltd., 14, Liverpool Road, Slough, Bucks, contains, in addition to the annual report and accounts, details of the firm's activities in the manufacture of gaskets, washers, strainers and associated equipment.

MAINTENANCE and EFFICIENCY

Organization of Civil Aircraft Inspection : Another Viewpoint on a Subject Recently Discussed

By S/L. H. R. BUNN, M.B.E., A.R.Ae.S.

IN *Flight* of March 30th an article appeared on "Maintenance and Safety," by one who modestly cloaked his identity under the pseudonym of "A Service Engineer." While the article was admirable in many ways, one feels that there are certain points which require a little deeper examination and some clarification.

Minor considerations on specific matters of fact include the query as to whether the approving authority for the inspectorate staff does, indeed, have to satisfy itself as to the adequacy of the *numbers* of inspectors employed. Surely this is a matter which can only be decided by the chief inspector on the spot in relation to the volume of maintenance, repair, and inspection work in hand. If this is not so, the tendency will always be to over-establish, thus rendering the system uneconomical on another score while certainly not improving its efficiency.

The most significant reference in the article was to the fact that the separate inspection system was the most efficient, particularly if as many as possible of the engineering staff are fully licensed for the types being operated. This is, of course, true, but the system was introduced originally as an interim measure solely because shortage of fully licensed engineers was felt to such an extent that the system of maintenance by fully licensed engineers could not be maintained and operated. If, for full efficiency, the inspection system requires the fully licensed engineer, and he becomes available in sufficient numbers, there is then no further need for the system.

In itself, the separate inspection system does not encourage operators to foster the taking of licences and by its function does not provide within itself the candidates for those licences. The implied employment of semi-skilled or unqualified labour, controlled by qualified engineers appears, on paper, to make for economy, because such employees are on a lower scale of pay than the qualified men. In practice, however, this apparent economy is often a false one. More unqualified personnel are required; for a given volume of work, because they are unqualified and comparatively inexperienced; they work less quickly; and frequently their work has to be completed or assisted by the qualified engineers. A similar position ruled in the R.A.F. during the period of manpower shortage immediately before the war, when the partially trained flight rigger and flight fitter was responsible for servicing, inspection, maintenance, and, to some extent, repair, usually under a Group 1 N.C.O. in each trade. The present author has good reason to remember that, however willing these partially trained airmen were, the unfortunate N.C.O. had to be constantly on call to assist, to clear snags, or to do a complete job.

The civil inspectorate system was originally based upon the R.A.F. A.I.S. scheme, developed during the war, but it is doubtful if it can be operated with the flexibility which characterized the Service system. Production was made much smoother by local easements, for which the A.I.S. officer on the spot was responsible; and the majority of the active inspectors were co-opted from production staff after a short period of instruction on inspection. In any case, with the increasing availability of fully licensed engineers, it would be both more economical and more efficient to modify the system by integrating inspection with production. The chief inspector would still be directly responsible to the directors and responsible for all advice on, and the broad direction of, inspection. The inspection staff itself, however, is drawn from amongst the fully licensed engineers on the production staff, whose licence qualifications themselves are more than enough qualification for inspection duties. It might be necessary for these inspectors to undergo a short course on methods of inspection, specification requirements, etc., with special reference to the type of work carried out by the production unit which they represent; but in many cases even this is not necessary. Control of inspection policy and compilation of regulations remains in the hands of the approving authority, which is also the responsible party for the approval of chief inspectors.

With this scheme, inspection can be completely co-ordinated and integrated with the production organization, thus making for harmony and smooth continuity of progress throughout the processes of repair, maintenance, and periodic inspection. Production executives can arrange the staging of this work with the production work, and ensure that the inspector is available at the right time to do it; they are not dependent upon the availability of an independent inspector whose programme may not be perfectly adjusted to dovetail with production requirements. Another advantage of this system is connected with the requirement that personnel should not be employed *permanently* on inspection. This is one of the main arguments against the external inspectorate system, for the reason that permanent inspectors tend to get out of touch with practical work generally and with technical developments in particular; they may, in the extreme, support inspection for its own sake as an end in itself rather than in the light of its proper place in the scheme of output. Inspection then tends to become academic rather than practical, and this has a deterrent effect upon smooth continuity of output and upon the easy relations between staffs engaged on inspection and production. Integrated inspection makes the replacement of inspectors after a period of, say two years, relatively easy, and erstwhile inspectors can be readily re-absorbed into the production cycle.

Assisting Output

A correctly integrated inspection system assists productive output, and is, indeed, as it should be, part of the productive system. This was recognized by the R.A.F., which introduced the A.I.S. system on flying units to increase efficiency, shorten turn-round time, and reduce manpower requirements—in other words, to promote both economy and efficiency of operation by assisting the productive flow: the scheme was *not* intended as a check upon production work as such. It should be noted, however, that it was not evolved to permit the employment of partially trained or semi-skilled airmen; the essence of its successful operation was that the production staffs should be fully qualified to carry out the work required, as indicated by Inspection on the task charts and snag sheets. This presupposes that, for successful civilian operation, production staffs should be fully licensed engineers, and that every encouragement should be given to staff members to become fully licensed.

It must be agreed by most people that the greatest efficiency in maintenance and repair can be ensured only by the employment of engineers fully qualified on the types upon which they are working, and the only way to ensure this is to guarantee a flow of suitable engineers and also to guarantee employment at a satisfactory wage or salary standard for the fully qualified engineer. This resolves itself into a cycle, the functioning of which can best be ensured by the integrated inspection system run efficiently.

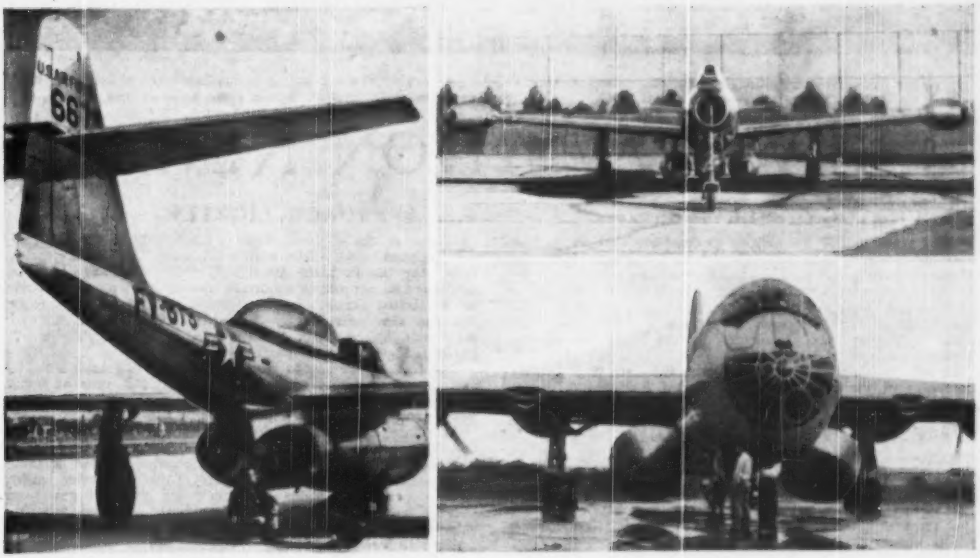
A system operated upon these lines would certainly not be less efficient than the external inspection system, and would, in the long run, prove more economical, mainly by improving turn-round time and thus increasing flying hours per maintenance man-hour, which is the true measure of

economy of maintenance. Any increased efficiency would also result in increased capacity, and reduction in the requirement for outside contractors, with a consequent reduction in costs.

At Cranfield recently, no less a person than Mr. S. Scott-Hall said that there was a lack of highly trained engineers in this country and there was too much tendency for engineers to shun administration. It is to be hoped that this does not apply to civil operators, for there is likely to be greater loss of both money and efficiency if maintenance and overhaul administration is not in the hands of fully qualified engineers experienced in the work which they administer. Statistics and wall-charts look well, but they do little to organize practical engineering activities; this needs men who know the job. However theoretically efficient a maintenance and repair system may be, it is practically useless unless it is thoroughly planned along practical and practicable lines; and such an organization can be evolved only by those who are fully conversant (by experience as well as by qualification) with the operation of maintenance and repair in practice. If the administration of the system is not efficient, it is saddled at the outset with an overhead charge for promoting its own inefficiency.

Finally, when cost figures are quoted, it would be as well to know if maintenance and overhaul costs include technical administration costs, or whether these are included under general administration costs. In some cases it may well be that technical administration costs are out of all proportion to the costs of the services they purport to administer. It would not be the first time—or, probably, the last—that the cost of running the office was entirely disproportionate to the cost of running the workshop, and it might follow that economy in maintenance and overhaul could best be inaugurated by first cutting the office costs.

AMERICAN APPENDAGES



EACH aircraft in this up-to-date trio of American military types exhibits "extras," fitted to airframe or power unit to improve utilization or performance. The Northrop F-89 Scorpion two-seat all-weather fighter (*left*)—an American counterpart to the Avro Canada CF-100—now has afterburners to increase take-off and climb capabilities, as indicated by the "swollen" tail-pipes of its two Allison J-35 turbojets. In the two bulbous containers attached beneath its fuselage, the Convair B-36 bomber (*right*) can transport a total of four 3,500 h.p. Pratt and Whitney Wasp Majors, six of which, in pusher installations, power the B-36. Above it is seen a Republic F-84 Thunderjet with two underwing drop-tanks of 230 (U.S.) gallons capacity, in addition to the two 230-gallon tip-tanks; combat range is quoted as 1,000 miles.

Specialized Fire-Fighting

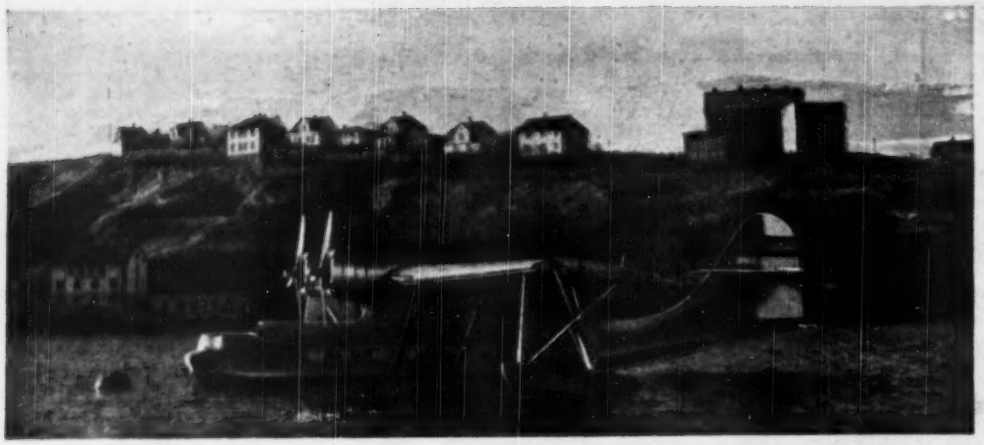
THOUGH similar in appearance to a number of Pyrene fire tenders delivered during the past year to airfields in many different parts of the world—an example was illustrated on p. 211 of *Flight* for February 16th—the latest production of this firm (the Pyrene Co., Ltd., 9, Grosvenor Gardens, London, S.W.1) embodies several important improvements.

This powerful, self-contained appliance is capable of delivering 3,500 gall of foam and 2,400 cu ft of CO_2 gas in about 1¼ minutes, and, it is claimed, can be brought into action within nine seconds after arrival at the scene of the fire. It is built on a Thornycroft Nubian chassis, which has ample ground clearance and four-wheel drive to ensure speedy transit over rough or soft ground. There are tanks for 500 gall of water and 60 gall of foam compound; the latter is sufficient for a further 800 gall of water, thus increasing the total foam output to 9,100 gall if an auxiliary water tender is provided.

The foam is produced by two Pyrene mechanical foam generators, each of which delivers 1,250 gall of foam per minute. These generators are built into the front wings of the vehicle and are permanently connected to the pump which supplies the water from the tank. This pump is capable of delivering 380 gall/min of water at a pressure of 150 lb/sq in, and is driven by a power take-off from the chassis engine. Each generator is connected to an 80ft length of 4in canvas hose fitted with a foam nozzle. The hoses and nozzles are housed in specially designed, quick-opening boxes located each side of the bonnet.

CO_2 is discharged from six 50-lb cylinders, coupled to two hose reels each carrying 100ft of high-pressure hose terminating in a gas-distributing horn fitted with a local shut-off cock.

Other recent Pyrene developments include the design and production of a photo-electric smoke-detector for installation in baggage compartments and other parts of aircraft not constantly under observation by the crew. It can be used to initiate automatic extinguisher equipment.



NEARER BY WATER : Although there is an Iceland Airways DC-3 flight serving Akureyi, on the North Coast, the airfield is some 15 miles distant ; their Canso service, on the other hand, alights in the harbour itself. International services use Reykjavik.

CIVIL AVIATION NEWS

U.K.-PORTUGAL SERVICES

LAST week B.E.A. announced its complete withdrawal from the Lisbon route with effect from tomorrow, June 2nd. Explaining this action, a joint announcement from the two British corporations pointed out that B.O.A.C. services to Central and South America are now in a position to fulfil all the traffic requirements between Britain and Portugal. The route is, in any case, duplicated by the Portuguese airline, Transportes Aereos Portugueses.

It will be recalled that Sir George Cribbett, the Deputy-Secretary of the M.C.A., recently visited Portugal to discuss load-capacity problems.

CONGRESSIONAL CONTRIBUTION?

UNDER the stimulus of continued British success in jet transport development, and influenced by the recent warnings that in an emergency the present U.S. transport reserve might prove somewhat inadequate, a concerted effort was recently made in Congress to introduce legislation which would ensure procurement of cargo and transport aircraft.

Current opinion in American aviation circles undoubtedly reveals an attitude of deep concern towards their industry's procrastination over the construction of jet transports. In this connection a member of the C.A.B., Mr. Harold Jones, is visiting Great Britain to study developments in this field. It is understood that one of the points he wishes to investigate is the claim that the Comet can be operated at 20 per cent lower cost per ton-mile and fly a 50 per cent greater mileage than present piston-engined transports. It has also been stated, however, that when Mr. Jones returns to the U.S. (we hope by then he will have been convinced) " it will not be his intention to instigate a sales campaign for the Comet."

Although jet transports are already in the design-study stage, the extent of Britain's lead in this field does not appear to have decreased. That this is realized is evidenced by the recent warning to the Senate Commerce Committee, by the vice-president of the U.S. Air Transport Association, that American airlines might have to "buy British." Admittedly, he was urging the approval of a government grant to stimulate the development of prototype jet transports.

The proposal called for a grant of $12,500,000 (to be administered by the C.A.A.) to help defray the cost of service-testing new aircraft types. Contrary to a previous statement, the U.S. Budget Bureau has informed the C.A.A. that it does not object to use of North American B-45s for this purpose.

Meanwhile the commander of the M.A.T.S., Maj. Gen. Laurence Kuter, has called for definite action one way or the other. He deplored the uncertainty which had prevailed hitherto, and which, he said "was hampering progress, discouraging airlines from purchasing and manufacturers from moving forward on their own."

U.S. APPROACH LIGHTING

AT one of the sessions (that on May 17th) of the I.A.T.A. Technical Conference held at Asbury Park, New Jersey, from May 9th to 20th, the C.A.A. threw some light on the controversial subject of approach lighting systems at airports in the United States. It was revealed that new systems to be installed this year will be based on I.C.A.O. standards—a statement hailed by the airlines as "breaking the international log-jam on approach lighting."

The C.A.A. intends to install single-row approach lighting systems at 17 airports before the end of this year and will also add to the list of five airports now using "slope-line" equipment.

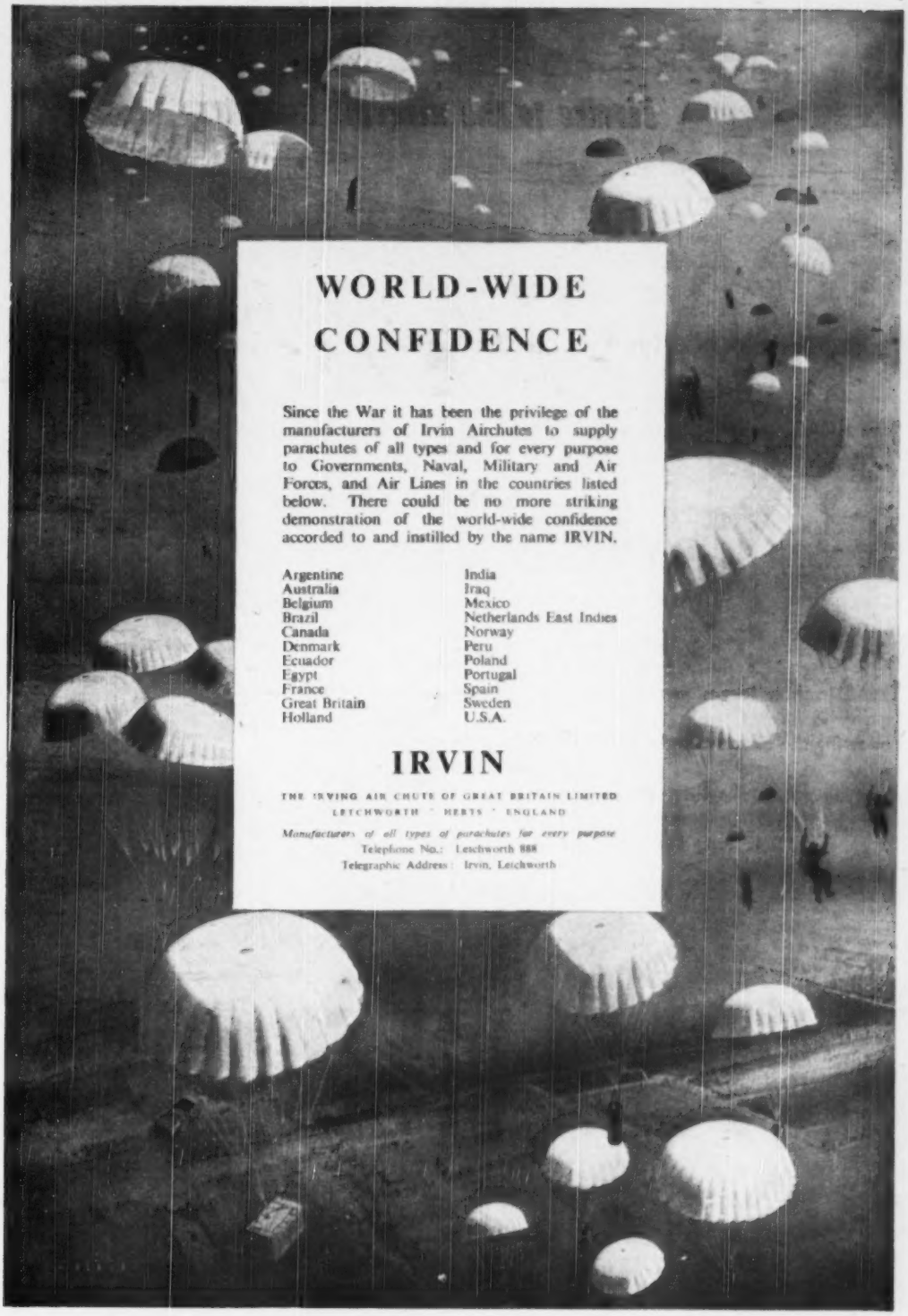
Adequate approach lighting systems are regarded by the C.A.A. as a necessary aid to I.L.S. or G.C.A., particularly in very bad visibility. I.A.T.A. has advocated the use of these installations at some 1,400 airports throughout the world. The Americans consider that their use to date has been delayed mainly because most governments, although agreeing substantially on the I.C.A.O. standards proposed, have been waiting to see which course the United States would take.

The "slope-line" pattern of light, an adaptation of the I.C.A.O. type "B" specification for high-intensity systems, is already in use at Washington, Idlewild, Los Angeles, Indianapolis and Arcata. This pattern is designed to indicate to pilots their glide path, angle of descent and angle of bank. For less critical conditions the C.A.A. is using the I.C.A.O. type "A" specification, which provides a smaller number of lights ranged along the left of the runway—an arrangement intended to assist pilots in lining-up.

The American choice, however, will not imply standardization throughout the world, and pilots on international routes will still have the opportunity of comparing the respective merits of the three systems approved by I.C.A.O. The "line-and-bar" arrangement installed at London airport is reported to give very satisfactory results, even in conditions of extremely limited visibility, and the French adaptation of this same principle (installed at Le Bourget and Orly) is also working well. Considerably more operating experience will be necessary, however, before pilots can justifiably claim preference for any one of the systems at present used.

HELICOPTER POSSIBILITIES

SPEAKING at Swansea on May 22nd, the Minister of Civil Aviation, Lord Pakenham, described the B.E.A. Cardiff-Liverpool helicopter passenger service (due to start to-day) as the beginning of a new era in air transport. Lord Pakenham considered that the helicopter might well be the answer to our future transport problems, and said that, although a considerable amount of development work still remained to be carried out,



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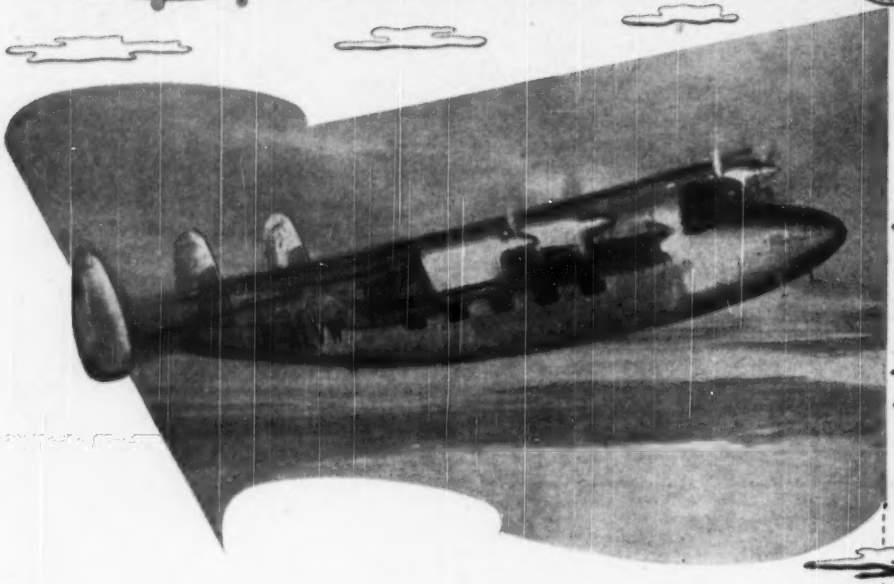

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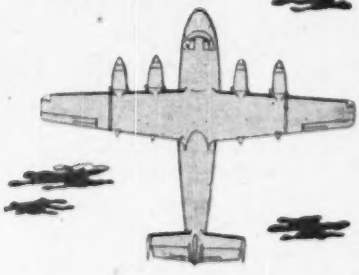

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by 1955 the helicopter should be showing "more than worthwhile returns for all the hard work which is going into its development."

He thought that although present-day aircraft would continue to offer competitive service on a number of longer routes, Great Britain itself was too small to take full advantage of high-speed aircraft; the requirement was for some form of transport to operate economically over short ranges with numerous stopping points—the helicopter would thus be ideal.

The first route pattern of the service was envisaged as being complementary rather than competitive to normal air transport. Lord Pakenham also expressed his Ministry's confidence in the fact that helicopters with economic performances would soon be available from British factories.

In granting Westland Aircraft, Ltd., and Rotor Stations, Ltd., an Associate Agreement to operate their B.I.F. London-Birmingham service, B.E.A. have denied themselves the privilege of being able to claim the Welsh operation as the world's first inter-city scheduled service, but they will, of course, be able to describe their own as the first "long-term" effort. The Minister, incidentally, recently congratulated the B.I.F.-service organizers on "an excellent performance." In all, the Westland-Sikorsky made 38 trips, covering 11,240 passenger-miles with a load-factor of 90 per cent. Details have appeared in the last two issues of *Flight*.

U.K. TRAFFIC IN APRIL

TOTAL movements at United Kingdom airports in April amounted to nearly 14,000—more than 10 per cent higher than the figure for the corresponding month of last year. Total aircraft movements numbered 39,169, as compared with 37,744, but pleasure flights and private and club aircraft movements decreased by 2,000.

The number of passengers using these airfields was over 165,000, 18 per cent more than in April, 1949. Nearly 12,000 of these were in transit and 60 per cent of all passengers used London and Northolt airports, which handled 42,000 and 59,000 respectively.

Over 2,150 tons of freight were on- or off-loaded as compared with 1,770 tons last April, an increase of 21 per cent. Detailed traffic figures for the larger airfields are given below.

Airfield		Aircraft Movements			Passengers (terminal and transit)	Freight (tons)
		Air Transport	Other Flights	Total		
Aberdeen (Dyce)		244	1,701	1,945	1,414	12.1
Belfast (Nutts Corner)		539	69	608	7,913	56.3
Birmingham (Elmdon)		223	1,225	1,448	2,154	13.4
Blackbushe		141	2,599	2,740	2,197	62.2
Blackpool (Squires Gate)		282	709	991	560	5.6
Bovingdon		70	1,221	1,291	529	199.8
Bristol (Whitchurch)		70	605	675	203	—
Cardiff (Pengam Moors)		68	1,929	1,997	356	—
Croydon		292	760	1,052	551	64.9
Edinburgh (Turnhouse)		204	1,605	1,809	2,030	1.7
Gatwick		88	262	350	556	0.1
Glasgow (Renfrew)		907	703	1,610	9,298	28.9
Hurn		22	2,873	2,895	86	0.1
Isle of Man (Ronaldsway)		652	141	793	3,949	24.6
Inverness (Dalcross)		207	33	240	894	1.8
Kirkwall		309	27	336	1,688	8.8
Leeds (Yeadon)		106	786	892	181	3.4
Liverpool (Speke)		494	752	1,246	4,850	39.7
London		1,997	765	2,762	41,957	735.5
Lympne		128	829	957	412	129.4
Manchester (Ringway)		820	1,102	1,922	6,033	152.4
Northolt		3,786	957	4,743	59,417	536.2
Nottingham (Tollerton)		14	693	727	135	—
Prestwick		487	366	853	7,825	25.6
Shawbury		23	1,010	1,033	116	—
Southampton (Eastleigh)		398	968	1,366	2,914	2.6
Southampton Water		62	113	175	1,595	27.4
Weston-super-Mare		—	114	114	—	—
Wick		320	10	330	757	0.4
Other Airfields		921	348	1,269	4,871	20.7
All reporting Airfields	April 1950	13,894	25,275	39,169	165,341	2,153.6
	April 1949	12,543	24,201	36,744	140,437	1,773.3

BREVITIES

IT has been announced that Persia and the United States of Indonesia are to become members of I.C.A.O. The total membership will thus be increased to 58.

* * *

On June 4th, K.L.M. will inaugurate a new service from Amsterdam to Madrid; it will fly *via* Frankfurt and Nice twice weekly in both directions.

* * *

At Richmond, Surrey, on May 22nd, a Tiger Moth pilot charged with low flying and having carried out an aerobatic flight within a controlled zone was fined £20, with £10 10s costs. A chief flying instructor who was a passenger in the aircraft was also charged on the second count, but in view of his previous good record he was granted an absolute discharge.

SHOWING THE FLAG: The British Embassy in Washington has recently taken delivery of a new D.H. Dove, here seen with G/C. Christopher Clarkson, Civil Air Attaché. Americans will now be able to see at first-hand an aircraft for which there would possibly be considerable demand in the U.S. if a reciprocal agreement for recognizing C. of A. were forthcoming. In this connection, it is understood that the difficulties experienced hitherto are well on the way to solution.

* * *

Sabena announces that a new airport is to be developed in the Belgian Congo; it will be situated at Dnjili, which is about eight kilometres from the existing airport at N'dolo. Two runways capable of handling aircraft of up to 90 tons are being provided at a cost of some 500,000,000 Belgian francs.

* * *

A Bristol Freighter operated by the Compagnie Air Transport is being used in France as a flying classroom for students of the Sorbonne Physical Geography laboratories in Paris.

* * *

Total aircraft movements at Orly and Le Bourget in April amounted to 5,371 as compared with 4,706 for the corresponding month of last year. The number of passengers handled also rose from 65,042 to 88,214 and the tonnage of freight handled increased from 1,535 to 1,880.

* * *

Canadian Pacific Airlines are hoping to obtain permission from the New Zealand Government for Sydney-bound passengers from Canada to night-stop at Auckland instead of—as they have to do at present—flying direct from Fiji to Sydney. If this privilege is granted, it is likely that P.A.A. and B.C.P.A. will be given similar rights.

* * *

The publication of our article last week "A New Empire Route" lends interest to the news that a new Qantas Airways service from Sydney to Johannesburg across the Indian Ocean is due to start to-day, June 1st. On the 8,500-mile flight, the aircraft will stop at Perth, the Cocos Islands and Mauritius. Among the economic advantages which this route will offer is that of rapid transit for business men and urgent cargo, in addition to a large airmail capacity.

* * *

A Bristol Freighter recently gave this country's first practical demonstration of aerial top-dressing. Data were obtained on wind drift, eddies and distribution of phosphate fertilizer over the area covered—hilly, inaccessible country in Wales. Although such terrain makes low flying difficult, it offers the best opportunities for aerial top-dressing. During the trials two flights were made, and the Freighter, directed by ground R/T, dropped 30cwt of phosphate from an experimental

CIVIL AVIATION NEWS ..

wooden hopper. Some 53 acres were covered, and results of the trials were described as encouraging. Bristol plans for top-dressing with the Freighter have previously been reviewed in *Flight* of November 24th, 1949, and March 30th, 1950.

* * *

During 1949, Australian internal route mileage rose from 39,321 to 58,248. Mileage flown increased by 3.8 per cent, and the total hours flown by 1.16 per cent. Although the passenger load-factor dropped from 68.6 to 62.9 per cent the spectacular rise in freight continued, reaching 39,324 tons as compared with 31,719 tons for the year 1948.

* * *

On June 4th, Mrs. Eleanor Roosevelt is flying to Scandinavia by S.A.S. to attend the unveiling of the Franklin D. Roosevelt Memorial in Oslo. S.A.S., incidentally, recently staged a "working Sunday" demonstration in which their three main bases at Oslo, Stockholm and Copenhagen were thrown open to the public; a highlight of the programme was the disembarkation from airliners of parties clad in the national costumes of the 33 countries served by S.A.S.

Replying to a question in the House of Commons, the Minister of Supply, Mr. George Strauss, gave details of the sums expended to date on the construction of the Brabazon I and its runway and assembly building at Filton. The figures quoted were £4,366,000, £2,110,000 and £2,948,000 respectively.

* * *

Speaking of the Brabazon at Birmingham recently, Sir Miles Thomas (chairman of B.O.A.C.) said, "If we of B.O.A.C. can operate that aircraft on the direct route from New York to London, and give the standard of comfort and luxury that the Brabazon promises, I think we shall have something that the Americans have not, and we shall scoop the pool of trans-atlantic traffic very much as the two 'Queens' have done at sea."

* * *

The Scottish Advisory Council on Civil Aviation is appealing to Sir Stafford Cripps to exempt Scottish services from the additional fuel tax. The majority of these routes, especially those to the northern and western islands, are uneconomic and are only operated as social services; the Council considers that it is unfair to penalize them further. Last year 142,000 passengers travelled on Scottish routes, the majority flying between the mainland and the islands.

GLIDING NEWS

A TENTATIVE fourth entry for the International Gliding Contests (July 3rd-16th) has been filed with the organizers in Sweden. The London Gliding Club and others are sponsoring the entry of Mr. G. H. Stephenson—first man to soar across the Channel and one with a continuous good record of cross-country soaring from Dunstable—if he is able to complete his Gold Badge qualifications in time. The London Club feels strongly that the B.G.A.'s decision to restrict British entries to Gold Badge holders was not a good one; it has been pointed out that a number of potential Gold Badge pilots are forced to confine their gliding activities to week-ends, when suitable conditions may not prevail.

The R.A.F. Gliding and Soaring Association is also considering F/L. Peter Mallett as the fourth entry, in which case the Association would be providing half of the official British team—a very commendable achievement in view of the short period during which it has been operating.

Present arrangements are that the team will travel by sea to Sweden. Expenses, except for £180 from the B.G.A. Contest Fund, are being found by the respective entrants. In the case of F/L. Forbes and crew, the R.A.F.G.S.A. is subsidizing his entry by a grant of more than half the estimated cost.

* * *

The R.A.F. Gliding and Soaring Association is progressing steadily, and plans are in hand for the formation of about a dozen clubs at different R.A.F. stations throughout the country. These clubs will draw their members from Service sources, which are generally unable to afford the civilian subscriptions and flying fees, and this extension of activities can be nothing but beneficial to the gliding movement as a whole.

* * *

Construction is planned of a sail-plane made entirely of plastic mouldings; designed by Mr. Hugh Kendall, chief test pilot of Handley Page (Reading), Ltd., it was the winning entry in a design competition sponsored by the British Gliding Association three years ago. The Ministry of Supply and the M.C.A. have both agreed to make grants towards the cost of two prototypes. Once the initial cost of making moulds has been met, quantity production should be economical.

* * *

Approaching the problem from safety first principles, the London Gliding Club is aiming to reduce the crash rate by tightening-up on training and on flying discipline. Their statistics show that the most numerous and expensive accidents occur during the "B" plus 10 hours stage. The faults attributed to pilots are often of the most elementary nature, indicating the correctness of insistence on more rigid standards of training and flying discipline. Emphasis is also being placed on adequate experience before promotion to advanced types.

Although publicity—and learning by the mistakes of others—is one of the surest ways of accident prevention, the B.G.A. accident analysis reports do not attain a wide circulation and, indeed, some are marked "Confidential—Not for Publication." More widespread distribution of such literature would probably do much to help others avoid the pitfalls.

* * *

The London Club, the largest in the country, opened the season with 290½ hours and 645 launches in April. Club members gained four "Cs" and one Silver Badge height, and there were five cross-countries from Dunstable, totalling 72½ miles. A close liaison is being maintained with the Surrey Club. Towing by Tiger Moth from the site at Dunstable has been successfully carried out after trial flights.

* * *

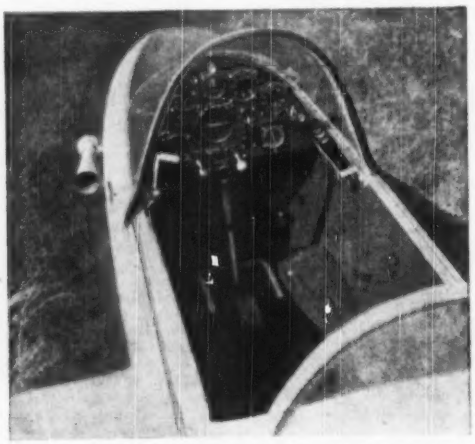
Programmes for summer courses have now been completed by most clubs. Bristol Gliding Club has given considerable publicity to its 12 weekly courses; the Scottish Gliding Union has eight courses planned; and the R.A.F.G.S.A. three. For those who are fortunate enough to be able to contemplate a gliding holiday in France, details of courses at French National Centres can be obtained from Service de l'Aviation Légère et Sportive, 24, Boulevard Victor, Paris 15.

* * *

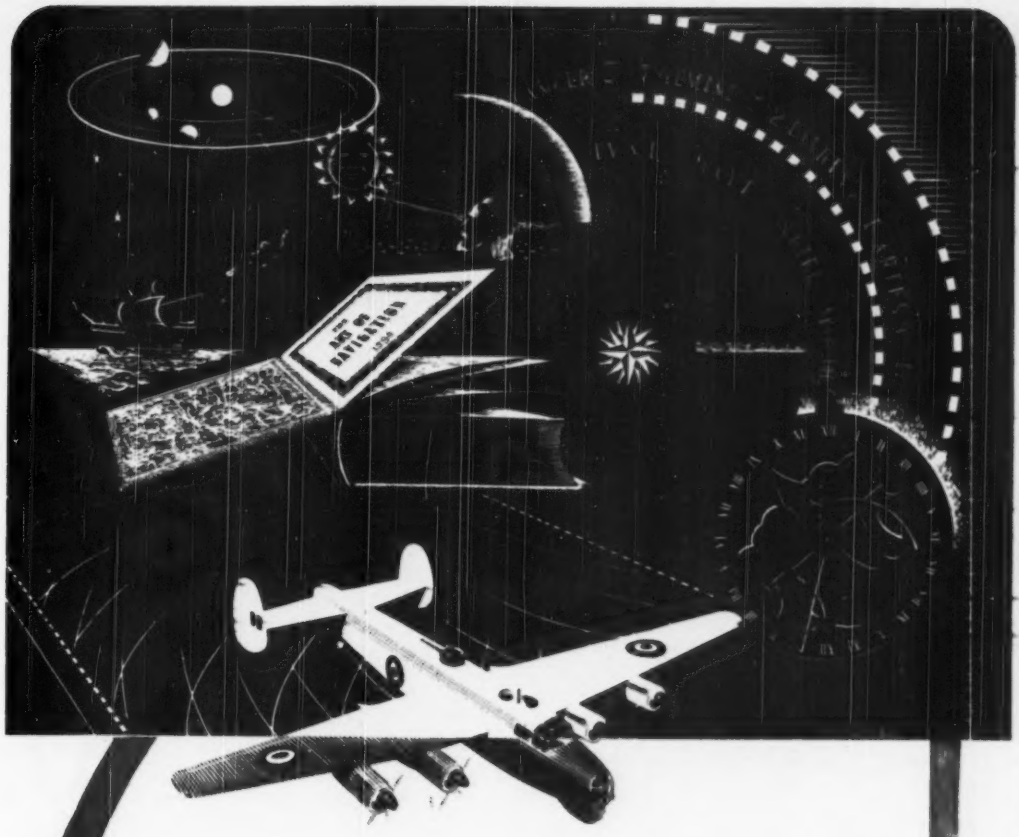
The British Gliding Association has now invited applications for the two new classes of membership decided recently at a council meeting. Private owners may now become members on payment of two guineas annually, entitling them to certain privileges, including representation on the council should their numbers exceed 25. Individuals may now become Associate Members on payment of 10s 6d annually.

* * *

Following the news that East German youth organizations are to be allowed to glide comes the news that West Germany's first post-war gliding club has been formed, at Dillenburg. Since gliding is forbidden by the Allies, the club will confine its activities to "discussing the scientific side of gliding."



HAWK'S EYES: With its comprehensive blind-flying panel, the Letov Lunak (Hawk) sailplane is well-equipped for high-altitude flight or "cu-nim" research. Mr. Ladislav Marmol demonstrated one of these high-performance Czech machines at the recent R.Ae.S. Garden Party.



Navigation—old and new

It is far from the days when the early navigators attempted to determine their position by cross staff, astrolabe and zodiac circle. It is more than 200 years since chronometer and octant first guided the ships of the world. Now, with modern navigational aids the Avro Shackleton, patrolling far from friendly shores, can carry out devastating attacks on objectives located with uncanny accuracy.

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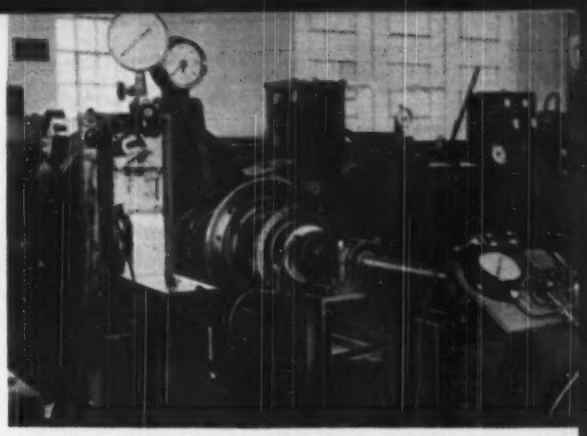
TESTING AIRCRAFT BRAKES

Satisfying the A.R.B. : How the Performance of a Drum-type Brake is Checked

By . . . . MAURICE F. ALLWARD

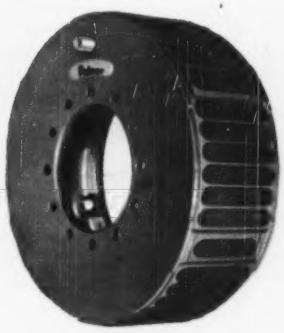


Test plant : the 100 h.p. railway-brake-testing machine : The massive flywheels can be seen in the left background.

THE setting up since the war of I.C.A.O., and the introduction of new standards and requirements for the construction and performance of civil aircraft, whilst certainly very necessary, have made more difficult not only the task of the airframe constructor, but also that of many component manufacturers. Among those particularly affected are the designers and manufacturers of wheel brakes. The requirements are, of course, not new, but whereas in the past a pilot had to deal with inadequate brakes by skilful handling, the Air Registration Board now insists upon adequate brakes with at least 100 per cent reserve.

These new requirements—together with the higher landing weights and speeds of modern aircraft, and the large reduction in aerodynamic drag (resulting in part from the use of nosewheel undercarriages), coupled with the fitting of small wheels that can be housed inside thin wings—have imposed a severe task on the ability and ingenuity of the specialists in this field. Their problems centre on efforts to produce the lightest possible brake providing the necessary torque to give the required deceleration, and at the same time dissipate or store the heat generated in the process, without reaching a destructive temperature. And during the past ten years the rate of conversion of kinetic energy to heat has risen fivefold, to a matter of 1,000 B.Th.U./sec!

As might be expected, brake designers have not found it easy to produce a brake able to meet these new requirements without a proportionate increase in weight. Most of the kinetic energy stored in a landing aircraft is dissipated as it is brought to rest by conversion to heat within the brake itself. If a certain weight of drum reaches a particular temperature this can, within limits, be reduced by increasing the weight of the drum and thus its heat storage capacity. An obvious step is to increase the operating temperature, but when this remedy is applied to drum brakes many difficulties become apparent. They are such that many people have been led to believe that the general problem can be solved only by the development of disc brakes.



Test specimen : Palmer drum-type brake with Ferodo "VG.97" inserts.

In view of the serious consequences that could arise from their failure, a comprehensive test programme for brakes intended for use on civil aircraft has been drawn up by the Air Registration Board, and is now laid down in the British Civil Airworthiness Requirements Manual.

The author recently had an opportunity of watching a Palmer aircraft brake undergoing this series of tests. The brake concerned was of the high-duty drum type and had been developed for use on the Handley Page Marathon. An outstanding feature was the use of composite brake blocks incorporating strips of "VG.97" high-duty friction material specifically developed by Ferodo, Ltd., to retain non-fade properties at very high temperatures. A disadvantage of this particular material when it became available was that it could not be moulded in the curved form, and was obtainable only in strips. A special mounting shoe had therefore to be developed before it could be used in a brake of this kind. These shoes consist of circumferential segments machined from a duralumin ring, recesses being milled in the outer surface to form housings for the narrow strips of friction material. An incidental advantage was, however, gained from the resulting gaps between the strips, which allow air to circulate to effect a certain measure of cooling. The main blocks, instead of being retained by the normal return springs, are kept in position by narrow intermediate blocks each housing a single strip of friction material. With these specially developed blocks the brake was known as the Mark 2, and in this form was used for the laboratory test.

In spite of the diminutive size of the brake—nine inches in diameter and three inches wide—its performance is such that very few machines of the requisite capacity are available for testing it, and in this case the 100 h.p. railway-vehicle-brake inertia machine in the Ferodo Research Laboratory at Chapel-en-le-Frith was used. The machine consists of a long motor-driven shaft to which are keyed two flywheels, and to these other flywheels can be coupled and the speed and weight adjusted to simulate the kinetic energy to be absorbed by the brake under test. Normally, the railway test-wheel is mounted between the two banks of flywheels, but in this case the brake drum was mounted on an adaptor on the other end of the flywheel shaft, and the brake itself mounted on a separate shaft concentric with the drum. This shaft is carried on a sliding saddle and the brake can thus be readily inserted into and withdrawn from the drum for inspection. An automatic recorder is connected to the brake and records the torque and stopping time for each run.

The test programme recommended by the Air Registration Board is divided into seven separate series of tests, each intended to prove a particular function of a brake. During the first, the *Static Torque Forwards Test*, the torque developed was measured at 25, 50, 75, 100 and 125 per cent of the normal brake-operating pressure. The torque should increase proportionately and should be within +50 per cent −25 per cent of the mean values obtained from a number of brakes. This tolerance appears excessive, but in practice there are so many variable factors affecting the actual

TESTING AIRCRAFT BRAKES . . .

figures that an allowance of this magnitude is essential, at least until further experience is gained and the necessary data obtained.

Test No. 2 is to determine the static torque developed backwards—which should be sufficient to hold the aircraft on a slope of one in ten. It can be omitted if the design of the brake renders it unnecessary, and, as an expander-tube brake functions equally well in either direction, this test was not carried out in this instance. It is usually only necessary in the case of brakes incorporating a servo action.

In the *Reduced-speed Stopping Test*, two stops were made to determine the action of the brake when applied fully at speeds equal to 10, 30 and 50 per cent of 1.1 times the flaps-down stalling speed of the aircraft concerned. Under certain conditions the torque developed could conceivably be in excess of the allowable tolerances of +50 per cent and −25 per cent of the normal torque.

The *General Performance and Wear Test* entailed making 25 "full K.E." stops and, as the title suggests, was made to determine the general characteristics and reliability of the brake. During each stop a series of observations were made, including the time to bring the flywheels to rest, the maximum temperatures reached by the brake drum and brake expander-tube, and the wear that had occurred in friction lining.

This information and the general performance in the test are useful in compiling the relevant maintenance and servicing instructions and in determining provisional periods between inspections and lining replacements. The brake drum at the end of each run was glowing red and the temperature reached was estimated to be 1,200 deg F. At the end of this test the drum was blackened and scored but was still considered serviceable.

Guidance must be given in the Pilot's Notes to avoid inadvertent use of the brake beyond the kinetic energy absorption-capacity. Normal everyday use should not exceed more than three quarters of the maximum capacity. The *Elapsed Time for Repeat Stop Test* was then carried out. A run was made and the temperatures of the brake drum and brake expander-tube and wheel rim at the end of the stop were recorded. The temperatures were then measured at minute intervals. This is necessary since there is heat radiation from the drum (which obviously cools steadily) to the brake and wheel, the temperatures of which rise until a peak is reached. The time taken for the brake assembly to cool sufficiently to allow a repeat stop to be safely made is noted and the information given in the Pilot's Notes.

Re-application of the brakes for parking an aircraft immediately after they have been used to arrest a landing-run may result in the rapid overheating and consequent damaging of the lining through its contact with the very hot drum. From the above test it is possible to establish a minimum cooling period which must be allowed before parking-braking, and this figure is given in the Pilot's Notes.

Test No. 6, described in the B.C.A.R. Manual as the *Overload (or "Accelerate-Stop") Test*, was next carried out, and for this the inertia machine was set to give 1.5 times the normal kinetic energy absorbed by the brake. The purpose of this is to prove the brakes capable of functioning should they be applied with the aircraft speed higher than normal. It covers the case of brakes being applied excessively early during the landing run, and also the occasional instance in which brakes have been used and, in the event of emergency during and immediately following take-off, have to be used again. The test is undoubtedly the most severe of the whole series. During the run, thick smoke was emitted from the brake and the exceptionally high temperature of well over 2,000 deg F was estimated to have been reached by the drum. It is a requirement that such overloading shall not cause total failure of the brake, nor should the torque exceed twice the certified maximum. That the Palmer brake, although exceedingly sooty and blackened, was still serviceable after this test, was due in considerable measure to the special heat-resistant expander-tube developed in this design.

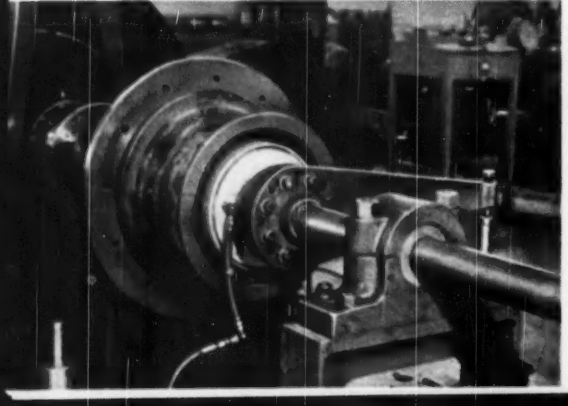
For the final or *Over-use Test*, two stops were made within five minutes of each other with no cooling between them, and the torque recorded. The requirements are that the condition of the brake throughout and after the test must not be such as might cause damage to the tyre, wheel, or any part of the airframe, although damage to the brake itself is permissible provided both stops are accomplished, while the torque should not exceed three times the certified maximum continued braking torque. In this instance these conditions were fulfilled. The purpose of this particular test is to reproduce the effect of continuous use of the brake—for example, heavy application during a landing run with immediate and extensive use during taxying.

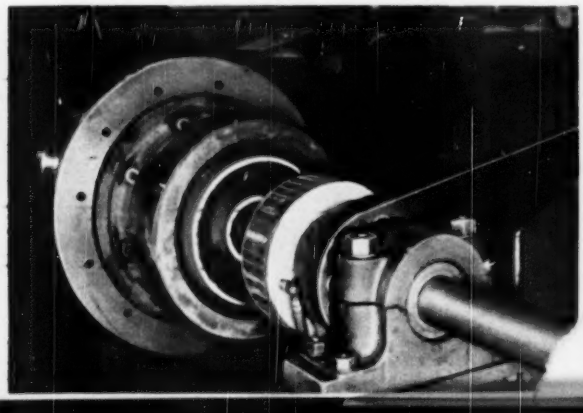
During the test seen by the author, nearly 1,000 separate readings of temperatures, stopping time, drum distortion and lining wear were taken by the Palmer test engineer and recorded on an impressive set of forms prepared for this purpose. More readings were taken than the test conditions required; they will be studied in the development of future brakes.

Rarely are the rewards for such rigorous testing so readily apparent as in this case. During the recent 40,000-mile Australasian tour by the first production Marathon, GA-ALUB, 250 landings were made; between these, it is stated, no servicing, adjustments or replacements had to be made to the brakes, which at all times gave full performance. Since the return of the aircraft to this country they have been inspected and are still serviceable.

It is interesting to compare the weight of this brake, which complete with the drum is under 15 lb, and the kinetic absorption capacity of 1.175×10^4 ft/lb, for which it is now fully approved. Dividing one into the other gives the figure of 13 lb weight for an absorption of one million ft lb of kinetic energy, and on this basis it is probably the lightest brake of its type yet developed. It appears to bear favourable comparison with some of the latest types of disc brake where figures of 18 lb weight per million ft lb of kinetic energy absorption are obtained. Whilst there are many factors affecting the applicability of a certain type of brake for use on a particular aircraft, these figures appear to indicate that, upon a weight basis, the drum brake is still suitable in many cases for the most modern aircraft.

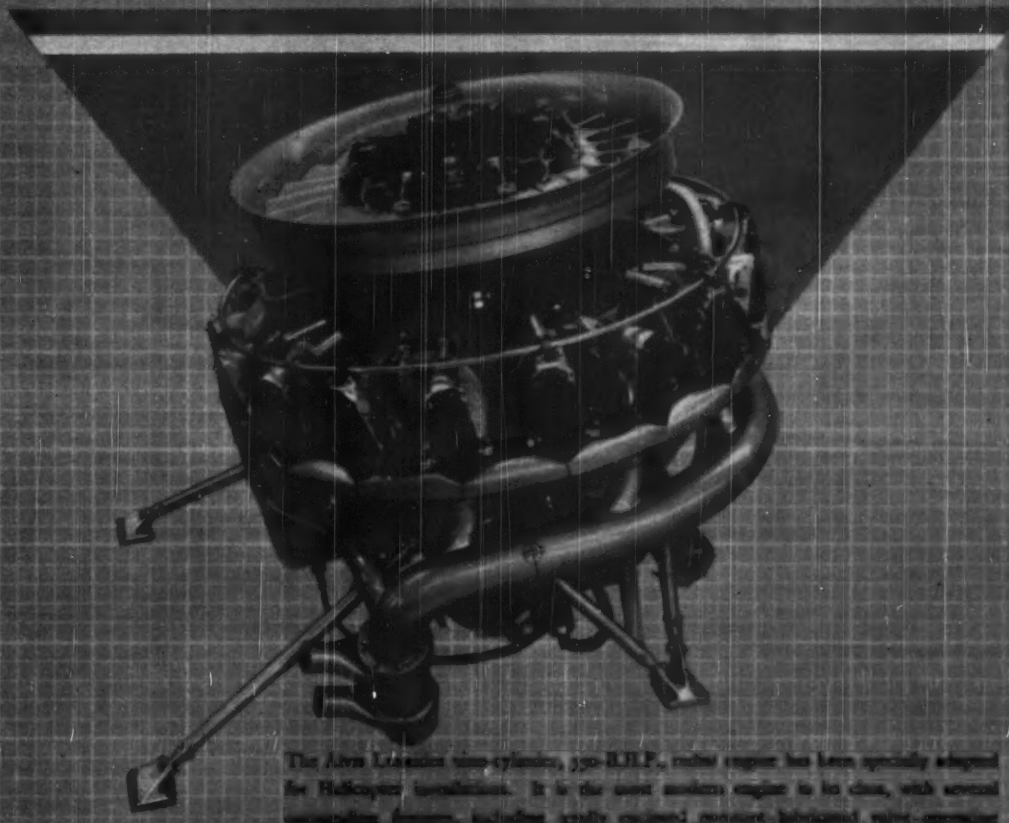
Left, the test brake assembled in its drum in readiness for the test run; right, the assembly is seen withdrawn for inspection.





ALVIS LEONIDES

Power Plant of the Bristol 171 Helicopter



The Alvis Leonides nine-cylinder, 550-B.H.P., radial engine has been specially adapted for Helicopter installation. It is the most modern engine in its class, with several outstanding features, including totally enclosed pressure-lubricated valve-operating mechanism, an anti-icing fuel injection system and automatic mixture and boost controls, and a special cowling arrangement, with pressure baffles and fan

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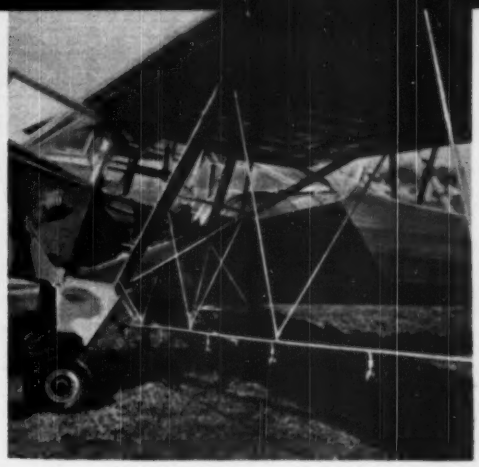
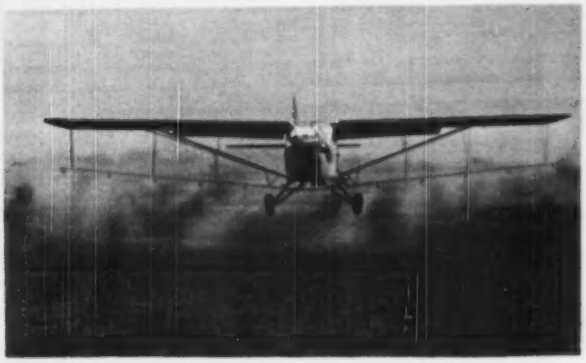




FARM-WORKERS

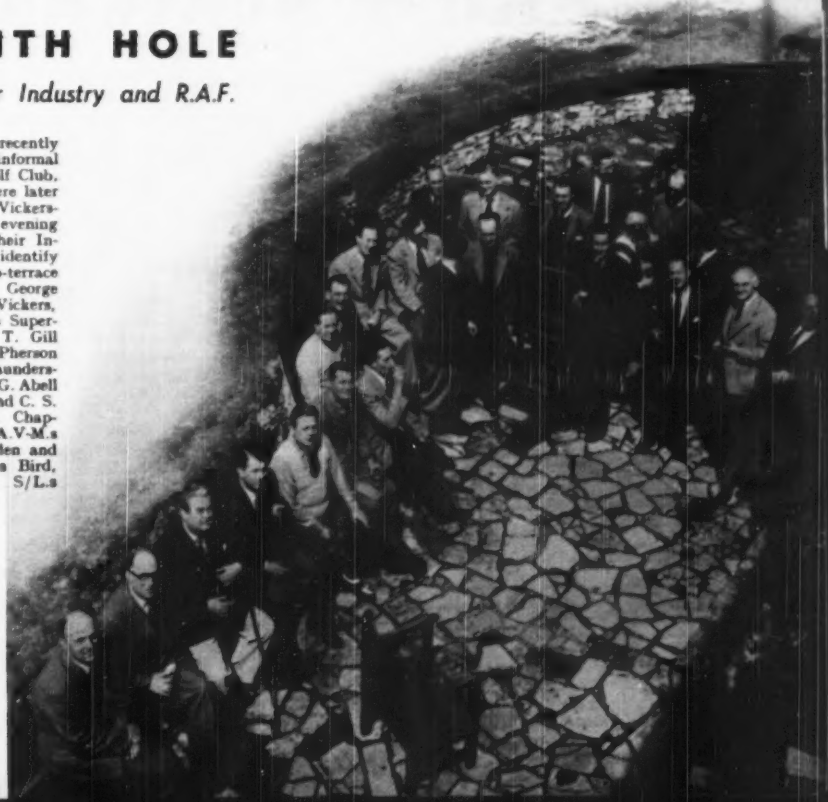
Agricultural Austers to Sow, Spray and Sprinkle

THESE new pictures of Austers fitted for farm duties give a good idea of the versatility of light aircraft, properly adapted, for work of this kind. At the top of the page an Aiglet is seen demonstrating suitability for crop-spraying, the liquid being forced from a 45-gallon fuselage tank by a windmill pump. In the detail view is one of the spray-bars, fitted with nozzles which can be varied in size and spacing. The lower view shows a Series J/5 machine dusting fertilizer (at 5 lb to 40 lb to the acre, according to requirements) from its 450-lb hopper, which has windmill-driven agitators. In each case the aircraft is flown at between 5ft and 8ft, so that turbulence helps the deposit to reach the underside of leaves. The hopper installation is equally useful for seed-sowing; Mr. Ranald Porteous recently sowed grass-seed on a Denbighshire mountainside inaccessible to ordinary agricultural machinery, attracting favourable comment from farmers.

NINETEENTH HOLE

An Afternoon Off for Industry and R.A.F.

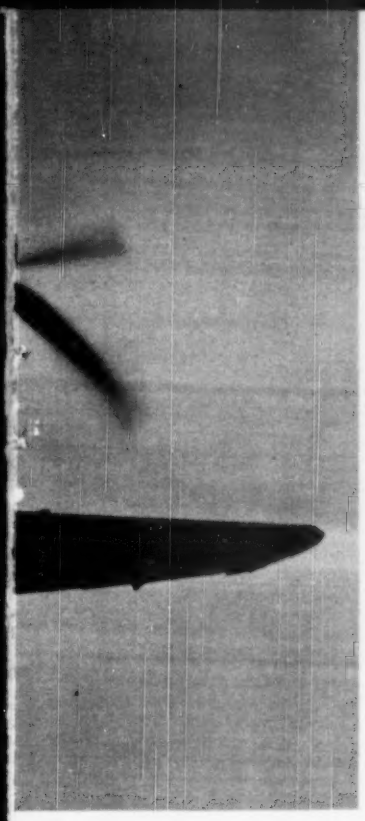
Members of aircraft firms recently met R.A.F. golfers in an informal match at St. George's Hill Golf Club, Weybridge, and the players were later entertained by the directors of Vickers-Armstrongs, Ltd., at an evening party. Readers who know their Industry and their Service may identify the following among this club-terrace group: Messrs. J. Summers, George Edwards and J. Bewsher (Vickers, Weybridge), J. Smith (Vickers Supermarine), R. Harker and W. T. Gill (Rolls-Royce), J. C. MacPherson (Fairey), Geoffrey Tyson (Saunders-Roe), H. Barroughes (Gloster), G. Abell (Bristol), F. E. N. St. Barbe and C. S. Thom (de Havilland), H. T. Chapman (Armstrong Siddeley); A.V-M.s Saunderson, Webster, MacFayden and Iles; A. Cdre. Marson; G/C.s Bird, Ubee, Carvell and Bulman; S/L.s Hampson and Butler.

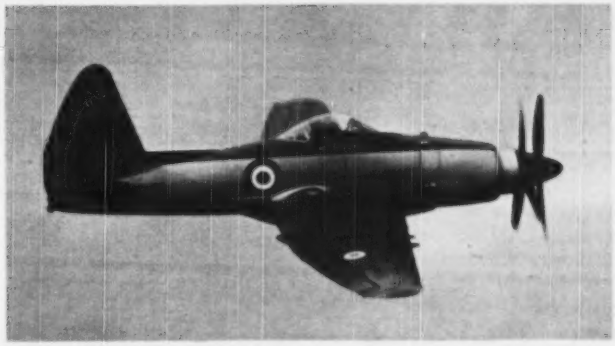


UP FROM SOMERSET

Lively New Portraits of the Westland Wyvern T.F. Powered by an Armstrong Siddeley Python Turbop Dragonfly H.C.2 Helicopter for Military

Illustrated by "Flight" Photographs

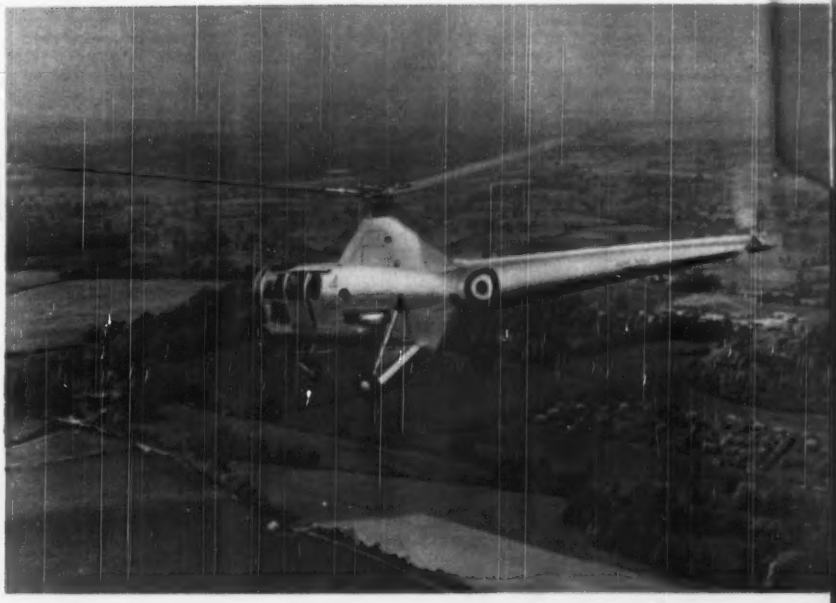




THE study of the Westland Wyvern T.F.2 on the left is given pride of place over the other views in this new Westland series because it is at once striking and informative. Especially notable are the partially retracted Dowty undercarriage (of exceptionally robust design), the Youngman flaps, and the latest location of the intake annulus for the Armstrong Siddeley Python turboprop. Though the fact is not immediately apparent, the tailplane now has a dihedral angle. In the side view on the right a new dorsal fin will be observed.

Those who saw the Wyvern at last year's S.B.A.C. Display remember it as a large aircraft. The proportions being those of a normal single-seat fighter, however, this fact is not especially remarkable in our photographs, except in the ground views, where direct comparison is afforded with *homo sapiens*. The contented looking members of this species, facing the camera at bottom left are, incidentally, Mr. Harald Penrose, chief test pilot, and Mr. Derrick Colvin. In addition to undertaking some of the experimental flying on the Wyvern Mr. Colvin is engaged on production-testing of the Dragonfly H.C.2 helicopters. The Dragonfly is the military variant of the S-51, and a specimen is seen airborne below.

.2 Strike Fighter, rop, and of the Use.



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DIRIGIBLE INTO DODO?

Lighter-than-air Craft Has Some Thoughts on the Complexities of Chequered Career and Sad Fall of Its Kind

Small airships are still used successfully in America for naval reconnaissance and various civil purposes; and one is under construction as a private venture in this country. But that the "airliner" airship is extinct there is little doubt; as the author of this article says, it was too big for what it had to carry. Some may still disagree.

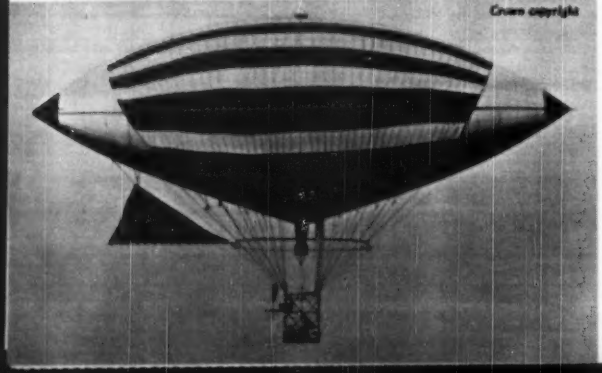
NOW that the airship is all but extinct as a factor in air travel, it is perhaps permissible to essay a tentative obituary, extolling in a proper manner the virtues, and recounting the triumphs of the craft, while lamenting the peculiar frailties of its constitution, which contributed much to the sudden eclipse which occurred at the height of its career.

The attempts which are made, on paper, every now and then, to prove that the airship is not totally extinct, but destined to rise once more like a Phœnix from the flames, always seem to be written with both great enthusiasm and a certain faint but persistent doubt of the validity of the argument. On the other side, the necrographer is conscious that, even as he writes, his subject may be peeping over his shoulder, an enigmatic leer on its ghostly visage. It it indeed a little difficult, especially for the younger generation, to realize that only fifteen years ago, the Zeppelins were plying a regular passenger trade among the German towns, and to South America, while the British and Americans were navigating the Atlantic and the United States in airships as magnificent as present-day ocean liners. But when the flames from the funereal pyres of the R.101, the *Akron* and the *Hindenburg* had died down, with them had died the tradition of the great rigid airship; and, in Britain at least, the death warrant was read soon after, with the rolling to pieces of the R.101's sister ship, the R.100. It is true that an attempt was made at resurrection in Germany, just prior to the onset of the last war, with another and vaster Zeppelin, and also by the Americans, about the same time, with a new type of welded duralumin gasbag: but war shifted care and attention to the airship's younger and more wiry relative, the aeroplane, and the brobdingnagian corpse was laid to rest for ever in the dust of history. In this era of universal dollar shortages and of suspicion between East and West, there can be no more of the injections of helium with which the untrustworthy gasbags of the old-world models were fortified to make another try against the vicious jolts of the elements. Again, in a world where engineers are growing steadily more scientific in outlook, talent has grown distrustful of the airship, which has always had about it an aura of charlatanry, bequeathed by the early balloons, demonstrated to the public as little better than fair-ground freaks, fair game for adventurers, decorative artists, and perpetual-motioners of all breeds: it was relatively easy for the amateur to induce an airship to rise from the ground —as contrasted with the initial knowledge required to get an aeroplane airborne—and this facility of invention led to many attempts where the necessary additional knowledge of control and stability was lacking.

It is with the intemperate youth of the airship that the writer proposes to deal here, for in the story of the middle years there is nothing of unusual interest to the non-specialist in aeronautics, beyond a lesson in economics.

The dirigible, or directed balloon, was born just under one hundred years ago, in 1852, in France, with the construction by M. Henri Giffard of a small non-rigid gasbag powered by a 3 h.p. steam engine. The flue gases from the boiler escaped through a chimney bent twice at right angles to avoid the balloon, and the stoke-holes were covered with wire gauze to reduce the danger of setting the fabric on fire. The three-bladed screw, 12 feet in diameter, revolved at 110 r.p.m., driving the ship forward at nearly 6 m.p.h. The disposition of the main components, in which the basket was slung freely from a pole itself attached freely to the gasbag, provided probably the one existing practical prototype of those amazing systems of vibrating arms and whirl-

In the heading picture is Giffard's airship of just over 100 years ago; below is the Tissandier brothers' dirigible of 1883. Both these illustrations, and those on the facing page, are of the beautifully made models in the Science Museum, South Kensington.



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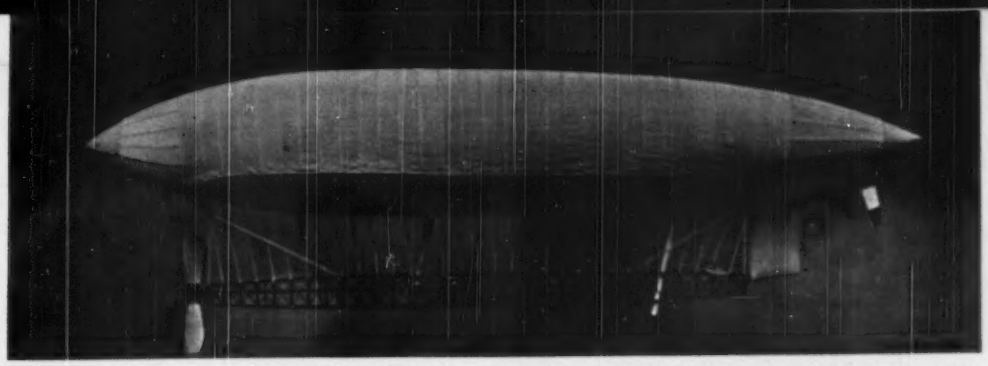


The Renard and Krebs airship *La France* (1884). Electrically driven, it achieved 14 m.p.h. Overall length was 165 ft, diameter 27.5 ft

ing masses that have appeared, to the despair of the student in physics examination papers, ever since Newton invented the infinitesimal calculus. With this machine M. Giffard contented himself, it is said, with "circular movements and lateral deviations." Three years later he constructed a larger model on the same lines, but after returning from its first trial flight it came to grief on landing, "thus," in the words of an earlier writer, "creating a precedent which has been followed by so many of its kind."

The following years saw some Heath Robinson methods of propulsion. In 1872 a Frenchman used gas from the balloon itself to feed the engine, air being pumped into a ballonnet to compensate for the loss of rigidity. The top speed was 3 m.p.h. History does not record what the pilot did when his fuel (and lift) ran out, though it is explained—one suspects rather hypocritically—that the plan was not proceeded with on account of lack of funds. During the Franco-German war the French army used a balloon, designed by M. Dupuy de Lôme, which was propelled by a screw worked manually by the eight passengers: this arrangement at once suggests itself as an admirable substitute for the old-fashioned Boat Race should the Thames ever become so crowded as to preclude the possibility of providing a clear stretch of water. In 1883-85 the brothers Tissandier experimented with an airship driven by a 9 h.p. electric motor, battery fed, and with it claimed to hold their own against a wind of over 6 m.p.h. The only really successful airship of this early age was constructed by the two French army captains, Renard and Krebs. Their design owed much to the example of the brothers Tissandier, usin, as they did, electrical power from a chromic-acid battery. Balance was achieved with a sliding weight. Subsequently named *La France*, the machine attained a speed of 14 m.p.h. over short distances.

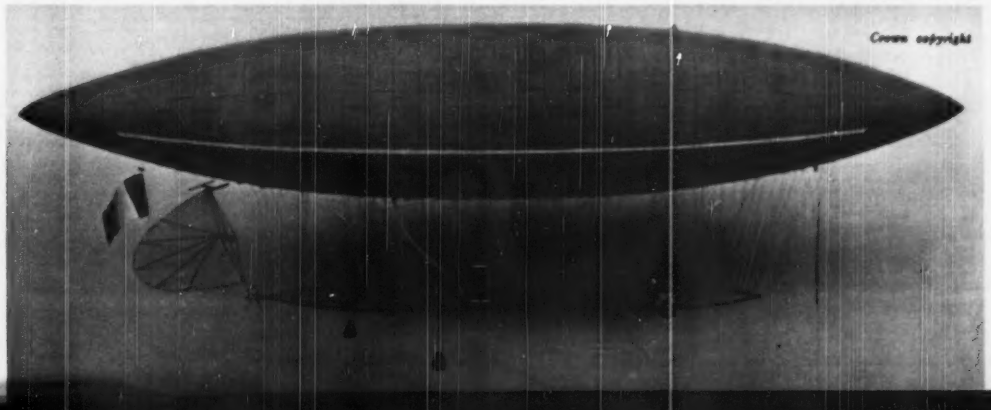
As those aeronautical engineers will realize who have themselves seen a steam engine and its attendant paraphernalia—Giffard's engine weighed 462 lb for its 3 h.p.—a satisfactory airship would not be realized until there had been evolved a power unit of moderate size and weight, which would, in the interests of safety, do its work without an accompanying shower of incandescent particles. With the last flight of *La France*, then, no further ascents were made until twelve years later, when, with the arrival on the market of the petrol engine, there was occasioned a renewed activity in airship construction, this time of a more lasting nature, although the beginning was as inauspicious as on the previous occasion.

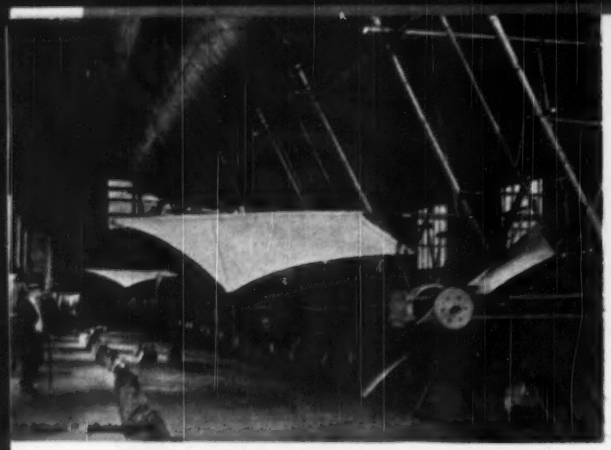
In 1897 a fresh lot of pioneers commenced work on petrol-driven airships. The names of two Brazilians, Alberto Santos-Dumont and Augusto Severo, are connected with experiments. Severo ascended from Paris in a balloon which had a system of double screws at each end of an axis bisecting the balloon longitudinally, and capable of working simultaneously. On taking off, the balloon ascended too rapidly, as a result of the valves jamming; and Severo's assistant, in a misguided burst of zeal, attempted to reverse the motion by throwing out all the ballast he could lay his hands on, causing the balloon to accelerate rapidly upwards to 12,000 feet, where it burst. [Another account, in Dr. J. M. Bacon's *Dominion of the Air*, says that the accident occurred at 2,000ft through escaping gas being ignited by the engine.—ED.] Santos-Dumont, although the inventor of several fairly successful dirigibles, lived through many accidents and near escapes from death, to tire of the airship, and became one of the first men to fly in a heavier-than-air craft. Among his exploits with the airship was a prize-winning flight round the Eiffel Tower. Using hydrogen in his first balloons, he later found it expedient to convert to coal gas, which he could buy at any local gasworks when on a cross-country flight.

In Germany at this time airships were built by Swarz and Wolfert: Swarz's machine was wrecked on landing, and Wolfert's blew up. Another German, the famous Count Zeppelin, took up the thread of development relinquished by Swarz and became the founder of a long line of the most successful airships the world has known. He staked his faith in the rigid airship; and although nowadays the only dirigibles in service are non-rigid, in their heyday the Zeppelins carried thousands of passengers without accident.

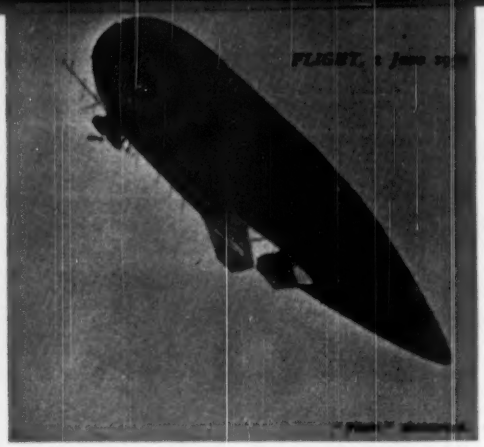
In Britain, the first attempts at construction were made, from 1902 onwards, by Stanley Spencer and Dr. Barton, both with non-rigids. The propulsive mechanism of Spencer's airship was simple: an automobile engine revolved a single screw, of the type similar to that found on rubber-driven model aeroplanes, projecting from the rear of the car. An early photograph depicts Spencer throwing a bucket of sand over the side—either, as the caption has it, in order to restore equilibrium, but more probably, judging from the direction of the sand, to try to catch the photographer off his guard. Dr. Barton's machine was more complicated. Two 47 h.p. motors imparted motion to a system of 30 "aëroplanes" (as they were described) dis-

The Santos-Dumont VI. At the beginning of the century the petrol engine solved the airship-builder's biggest problem.





Bamboo forest: Dr. Barton's airship under construction in 1903-05.



The Willows Co. built five successful airships; one is shown above.

DIRIGIBLE INTO DODO? . . .,

posed round the car on all sides. The mechanical complexity and consequent aerodynamic interference must have been considerable; however, a successful flight was made.

Much subsequent development in Britain was due to the work of Willows. The third of his airships, with an old aeroplane fuselage slung underneath, formed the nucleus of the several-hundred-strong force of coastal patrol airships built up by Britain during the first world war. A few rigid airships were constructed in Britain, but they were not wholly satisfactory—the first of them, the *Mayfly* (a short-lived summer insect), was too heavy to lift itself—and it was not until engineers were able to examine the structure of a Zeppelin shot down in a raid over England in 1916 that a reliable rigid airship came to be designed. This was to become the R.33. The next design, the R.34, was the first airship to cross the Atlantic. During preparations to land in America, some trouble was experienced: there was no one on the ground able to direct the landing operations, so a member of the crew parachuted down, and after quieting the spectators, recruited a makeshift ground crew hastily instructed in the art of securing a giant airship.

In 1928, when the *Graf Zeppelin* paid a visit to the United States, the German airmen experienced the irreverance of the native character. News spread around that the overdue Zeppelin was holed in the stabilizer, and a large audience gathered at Lakehurst, in New Jersey, in the gleeful expectation of witnessing a close-up of the prang. The scene was described by James Thurber in a contemporary issue of *The New Yorker*. A company of marines was detailed to assist in the landing, but the crowd milling in confusion over the landing field rendered operations hazardous. To a call for quiet to let the landing crew hear the orders, the crowd responded with tooting on motor horns. A captain of marines appealed to the crowd to behave: "Put out your cigarettes, cigars, pipes—" he shouted. The crowd took up the refrain, "—chocolates, popcorn, Coco-Cola . . .," it chanted, stirring up the dry earth of the field in a cyclone of dust, in which, eventually, the Zeppelin came down. The crowd burst through the sweating ranks of marines and surged towards the airship, to gather what souvenirs it could from the wreckage; but the airship was undamaged, and the disappointed crowd dispersed.

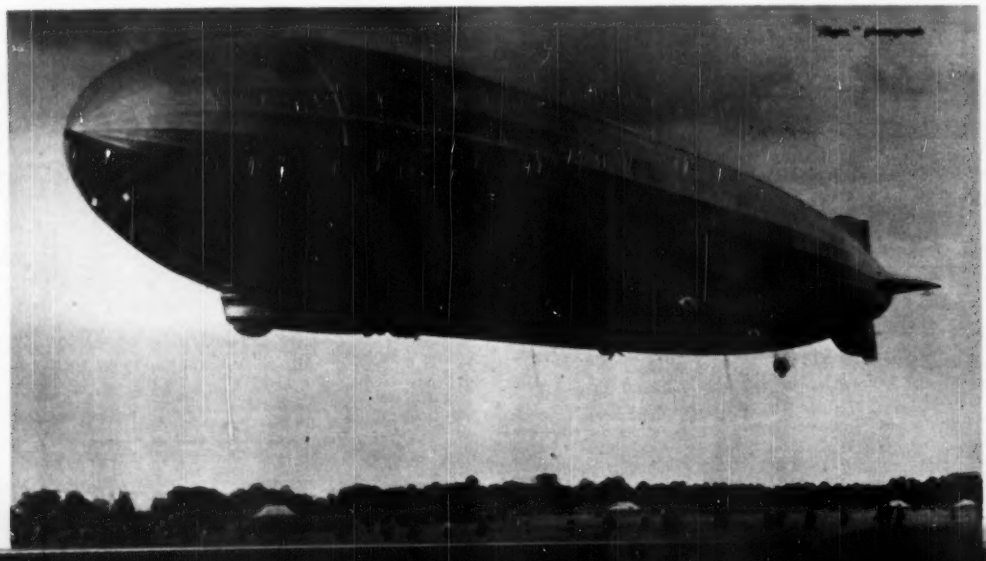
And so we must leave the subject. If the writer were less honest than he professes to be, he might conclude his obituary (after reciting the series of calamities that darkened the declining years) in the customary manner, relating, with a hint of tears in his voice, how the airship was untimely snatched from our midst at the beginning of a career of great promise; but as he is truthful he will acknowledge to be relieved that he was not born till the aeroplane came. After all, who would lumber along on a hippopotamus when he may have a thoroughbred for his ride?

To take another analogy. The aeroplane is like a Channel swimmer stripped for action, while the airship is like a non-swimmer wrapped from head to foot with cork-jackets and air-bladders. The airship was much too big for what it had to carry; this, perhaps, was its undoing. A thousand houses may burn to the ground in a day, and escape notice, but you cannot topple over the Empire State Building and keep it out of the papers; which is why airship crashes always hit the headlines; and bad headlines, as everyone knows, are bad for business.

And there the writer will presume no further on the forbearance of the reader, and leave the subject finally.

M. N. M.

The Graf Zeppelin made commercial crossings of the South Atlantic. She is seen here during a visit to Hanworth in 1932.



Sir Richard Fairey, M.B.E., Hon. R.Ae.S.

AVIATION and what it costs

Sir Richard Fairey's Wilbur Wright Lecture to the R.Ae.S. : What the World Has Spent on Aeronautics Since the Wright Brothers First Flew : Part I : Civil Expenditure

ADMISSIBLE in every way to that select category of lecture which—like Mr. Peter Masefield's classic Commonwealth Lecture of 1948—serves for long afterwards as a standard work on its subject, Sir Richard Fairey's *Some Aspects of Expenditure on Aviation* was delivered before the Royal Aeronautical Society last Thursday, May 25th, constituting the 38th Wilbur Wright Memorial Lecture.

Appreciation of Sir Richard's masterly treatment of his theme can be equalled only by admiration of his courage in tackling such a vast and imponderable subject (the almost apologetic title of his paper, in the best scientific tradition, gives no hint as to its panoramic scope). Having invoked the aid of numerous authorities, printed, written and verbal—his list of acknowledgments is one of the longest we have seen—he condensed what must have been a formidable mass of raw material into a paper of only average length; had it illustrated with 17 admirably drawn graphs; and achieved a result that any author of treatises might profitably take as a model.

His introductory passages may be summarized, very briefly, by saying that he began by pointing out that any assessment of what the world has spent on aviation since heavier-than-air craft first flew ought to involve the use of a reliable yardstick, which, however, was manifestly non-existent. Nevertheless, with some standards we could at least make a relative measure of achievement, provided we appreciated their shortcomings. The man-hour standard was tempting, but one found that it varied enormously from country to country, and was impossible to use outside the sphere of manual labour. Probably the least unsatisfactory measure was that of currency, and the obvious selection was the dollar, which had suffered the least change—even so, allowance had to be made for the fact that, in considering its value in purchasing power of manual labour, the original length of this yardstick had shrunk by some 66 per cent in the past 50 years. (Sir Richard illustrated dollar and wage-rate fluctuations by means of graphs, not reproduced here.)

It would avail little, explained the lecturer, to use an average dollar over the whole period as the standard, particularly in converting to dollar values the other currencies concerned. Moreover, the volume of work done was by far the greatest at the period when the dollar was declining towards its lowest and when wages were rising in the same order to offset the change. Accordingly, for the purposes of his paper he had decided to convert currencies to the dollar rate pertaining to any particular year under examination. Owing to the absence of complete figures after 1948, he had been forced to terminate his survey there—or, rather, at the end of the financial year 1948-49, which was March, 1949, for the United Kingdom and June, 1949, for the United States.

After dealing at some length with the difficulties of disentangling civil and military aviation expenditure, and of the complications introduced by Government subsidies, Sir Richard turned to the question of aircraft costs from the earliest days to the present time.

Many of the pioneers worked with their own hands, even when, as the Wright brothers did, they employed other help. I believe [continued the lecturer] that Mr. Taylor, their mechanic, was paid $15 a week. The cost of the very early aircraft was mostly that of materials and of the engine, if it were purchased separately. The original Wright Flyer, which weighed only 605 lb empty, is said by Orville Wright himself to have cost between $1,000 and $2,000, and the same applies to the first batch of six built in 1907. Sir Francis McClean still has the receipt from Orville Wright for Flyer No. 3, at £1,000, then equivalent to $4,865.

It is when aircraft were first built for sale that we can get a closer measure of cash value. For example, the Farman biplane was advertised for sale in 1908 at $5,840. The Voisin exhibited at the Olympia Show in 1909 was priced at $4,620 but guaranteed to fly for three miles, and Lord Brabazon's original *Bird of Passage*, another Voisin, flown by him in 1909, cost him $4,860, plus $3,400 for the engine, as compared with Mr. Glenn Martin's aircraft of the same year at a price of $4,200.

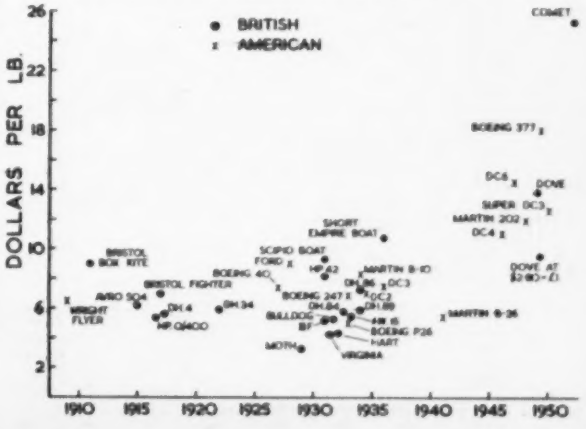
A little later the Handley Page Company were quoting $1,825 for a single-seater, and M. Santos Dumont $1,700 for a Demoiselle.

In fact, it seems from a search of the records for the years from 1909 to 1914 that the price fell generally within the range of $1,500 to $10,000, including an order for six Short seaplanes purchased by the Admiralty at a price of $9,750 apiece, less engine, and it is interesting to note that the British and Colonial Aeroplane Company (now the Bristol Aeroplane Company), founded in 1910, built in that period 77 "Boxkites," which were sold at $4,840 and $5,700 apiece, and a number of other types, none of them costing more than $6,000 each, including the engine.

Since those days we have seen aircraft grow rapidly in size, speed and standards of passenger comfort to such modern examples as the Boeing Stratocruiser at the empty weight of 83,500 lb for $1,500,000, and a cruising speed of up to 340 m.p.h.; the DC-6 at 53,500 lb for $750,000 and 310 m.p.h.; or the jet-engined Comet at 46,830 lb for approximately $1,200,000 and 490 m.p.h.; and still we have small two-seaters, such as the Piper Cub, for $2,795—that is, in the same order of price as the earliest types.

Examination of price in terms of cost per lb tare weight has little meaning in the light of other variables, but does disclose the interesting point that the average has risen throughout only in the ratio of three to one, or by the same degree as the dollar yardstick has shrunk. The earliest aircraft were from 5 to 10 dollars a lb and remained in that region until about 1934, when the change of method of construction of

Fig. 1. Prices of aircraft per pound weight (empty)



AVIATION and what it costs . . .

the stressed-skin monoplane and the increasing complication of furnishing and equipment drove it upwards to from 12 to 18 dollars a lb for modern piston-engined airliners and higher still with the increased cost of jet units (Fig. 1).

This apparent constancy when allowing for the dollar shrinkage is merely coincidental and reflects the fact that the vastly increased complication of structure and elaboration of equipment, passenger comfort, and so forth, have been balanced by modern production methods and the greatly increased production.

An entirely different picture is presented if these comparisons are made on a basis of potential life, or, rather, in potential passenger-miles to be covered.

This cannot be computed for military aircraft as in peacetime they become obsolescent and sometimes are scrapped ruthlessly in favour of superior types, and in wartime many meet with violent ends, although the life of war aircraft is longer than might be expected. A United States Air Force Statistics Control Division letter in April, 1945, quotes a life of 10 months for a fighter, 12 months for a heavy bomber, and 42 months for a transport.

In civil use the potential life of the airframe itself has gone up from a maximum expectancy of an hour or so of flying time (in the days of the flimsy wooden craft of the pioneers) to the modern monoplanes which have so increased in durability as to be good for a life in the order of ten million miles.

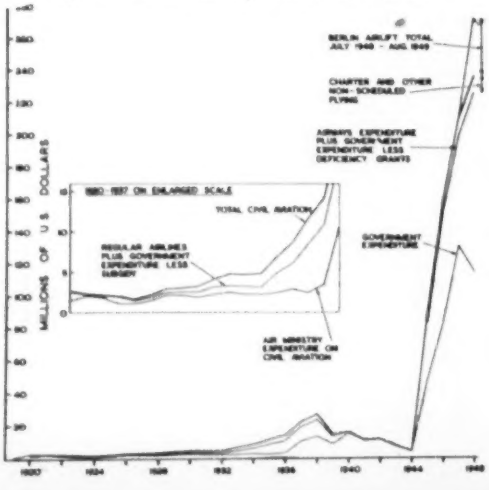
Nor need this be the upper limit. With increased demands for additional strength and higher safety factors to cope with high speeds, with correspondingly increased stresses on encountering air disturbances, coupled with the advent of the jet unit with its reduction of vibration, and such things as improved materials, aircraft are likely to become ever stronger and longer lived. Therefore, we may look forward to a decreasing capital cost per passenger-mile provided that the greatest possible utilization of the airframe is made before it is overtaken by obsolescence. In this the rise in cruising speed manifestly will have an important effect. In operation such jet aircraft as the Comet should be able to run off passenger mileage in half the time of the older and slower types.

This factor of ever-increasing life, with its correspooding decrease in the capital cost per passenger-mile, is the outstanding one revealed by any study of the cost of the individual aircraft. From something in the order of a hundred dollars per passenger-mile in the very earliest types it has decreased until now it can be reckoned in fractions of a cent, and is still decreasing. It emphasizes the basic cheapness of the aeroplane as a vehicle and holds out prospect of further reductions in the cost of flying.

[At this point in his lecture Sir Richard Fairey said that the foregoing analyses only partly indicated the growth of expenditure on civil aviation over the last half-century. This aspect he now proposed to examine, taking into account only that expenditure which reflected a picture of the human effort involved, and ignoring the questions of income and profit and loss.]

Civil air transport proper [he continued] began after the First World War. In the United Kingdom and France it got away with a rush, somewhat optimistically, because of the

Fig. 2. Civil aviation expenditure, Great Britain.


MILLIONS OF U.S. DOLLARS
BERLIN AIRLIFT TOTAL JULY 1948 - AUG. 1949
CHARTER AND OTHER NON-SCHEDULED FLYING
AIRWAYS EXPENDITURE PLUS GOVERNMENT EXPENDITURE LESS DEFICIENCY GRANTS
1920-1937 ON ENLARGED SCALE
TOTAL CIVIL AVIATION
REGULAR AIRLINES PLUS GOVERNMENT EXPENDITURE LESS SUBSIDY
GOVERNMENT EXPENDITURE
AIR MINISTRY EXPENDITURE ON CIVIL AVIATION

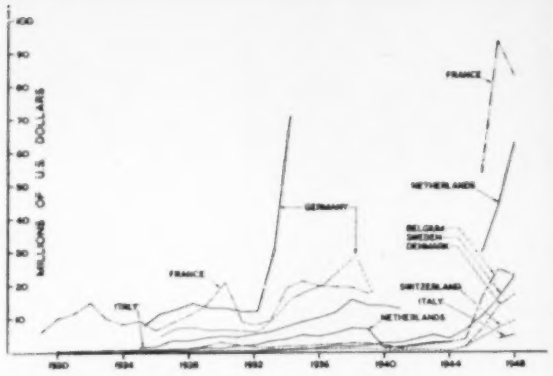


Fig. 3. Civil aviation expenditure, major Continental powers.

attractions of the London-Paris service as a likely paying proposition. Handley Page Transport, Instone Air Line, Aircraft Transport and Travel, Ltd., all started as private ventures and with a considerable measure of initial success. Soon, on this route, they encountered the competition of the subsidized French Compagnie Messageries Aériennes, which cut the fare from $34 to $22 in 1921.

In the United States the country was soon covered by a network of air-mail lines which received their charters by competitive bids for Post Office contracts. It was in 1926 that they first started carrying passengers on scheduled airlines on a serious scale, and official figures of mileage are available from that year onwards.

In Europe France took the lead, soon to be followed by Holland, where the K.L.M. was among the first operators in the world to spread out overseas. European companies also were operating abroad in the early 1920s.

Contrary to early hopes, however, the aerial age had not really arrived yet, and soon governments were coming to the rescue, not without self-interest with an eye to national advantage and to the maintenance of aircraft factories as an insurance against future military needs. In the first six years after the First World War the world level of expenditure remained at between 20 and 30 million dollars.

All countries remained at their respective levels, of which France and Germany were the highest, until about 1926, when scheduled passenger-carrying began in the United States, and the French, German and British graphs all start to lift, and a further definite rise starts about 1933 when a number of influences were at work (Figs. 2 and 3). This was the period of recovery from the world slump and the accession of Hitler to power, but one of the most important factors was the introduction of the all-metal monoplane—a great step forward in construction and efficiency, together with the increase in size that it made possible. The Boeing 247 made its appearance in 1933, followed by the DC-2 in 1934 and, shortly afterwards, the DC-3. The Short Empire flying-boat was in operation by 1936. There was a marked advance in passenger comfort and regularity of service, and air travel as such began to take its place as a real competitor with other means of transport. This is the period when the civil aircraft really took root.

Examining the graphs of individual countries during this period and until the outbreak of the Second World War (Fig. 4), the United States is most prominent by the steady increase of civil air activities under the stimulus of the competitive air-mail contracts, which paved the way for civilian transport, and soon a network of airlines spread over the whole country, linking all the major towns; services rapidly improved in number and regularity, and in a few years the famous DC-3 was to monopolize the picture.

Activity in the British Empire (Fig. 5) shows the same characteristics on a reduced scale to a peak of 60 millions in 1938, of which Great Britain supplied nearly half, and Canada and Australia one-sixth each. The drop in the curve from 1938 reflects the onset of the war.

The major European countries in general display the same trends, the apparently erratic course of French expenditure being partly due to fluctuations in the exchange rate, although other influences were also at work (Figs. 3 and 5).

In Germany, the amalgamation of a number of air transport concerns into the Deutsche Lufthansa in 1926 formed the biggest single civil operating organization in the world. Published figures of its expenditure in the first few years show a period of consolidation at between 6 and 7 million dollars.

In 1932 the German graph develops symptoms of altogether abnormal expansion that soon are to preclude it from being reckoned as bona fide civil aviation expenditure. I have been

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The past 30 years have seen not only the development of British airlines from the first London-Paris service to a vast network covering nearly 70 countries, but also the steady maturing of something beyond machines and scientific progress. Throughout Britain and the world this has come to be known as British Airmanship and already it has earned a significance comparable with that which traditionally attaches to British Seamanship.

British Airmanship sums up the reputation for skill, enterprise and reliability which in just over a generation of air travel has become inseparably associated with British airmen — something, indeed, to be proud of.

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AVIATION AND WHAT IT COSTS . . .

forced merely to indicate its scope and after 1934 to revert to the expenditure on airlines only. Obviously with the advent of the Third Reich, Germany, having cast off the restrictions imposed on her, was deliberately stimulating aerial activity to the limit of her resources.

Of the remaining countries Italy ranks high with a peak expenditure of 15 millions in 1938. Belgium and the Netherlands, largely by virtue of their overseas services, display considerable activity in proportion to their size, as also does Sweden.

The same general features are displayed on civil aviation expenditure in Central and South American countries. [Here the lecturer showed a collective graph for these nations].

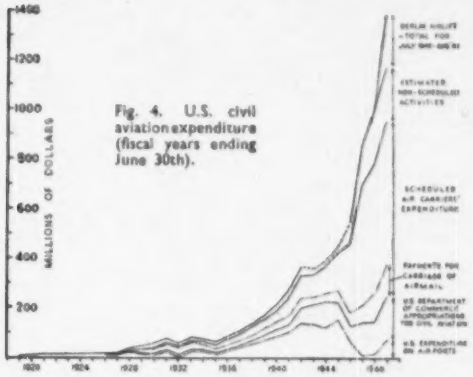

Fig. 4. U.S. civil aviation expenditure (fiscal years ending June 30th).

Many South American airlines were pioneered by American or European concerns, as, for example, the early German activity in Colombia and Bolivia, and that of French subsidiaries in Brazil and the Argentine.

The Japanese figures, while lower than might have been expected up to the outbreak of the Pacific war, thereafter rise at a rate that is unacceptable as civil aviation, and the bulk of it must be accredited to military purposes. Since the war it has ceased altogether.

Chinese figures are extremely conjectural and complicated by the degree of American help accorded them, much of which was military. For a period after the war there is a great increase in activity. Passenger-mileage, which is estimated at 8½ millions in 1936, goes to a peak of 150 millions in 1946.

Of all the countries, Russia provides the greatest difficulty in any attempt to arrive at a reasonable estimate of civil aeronautical operations, nor are such figures as are available easily converted into units of expenditure. Well-founded statistics of numbers of passengers and route mileage are published by Mr. J. Parker Van Zandt, but there is no clue as to the total number of passenger-miles involved, and the only bases of comparison are the published civil air activities as a percentage of the total air vote up to 1939; these reflect a considerable rate of growth. A large amount of Soviet civil activity is due to the carriage of freight and quite a proportion to mail carrying. Of later years there also appears to be considerable activity in such matters as crop-spraying, pest control, and other agricultural duties.

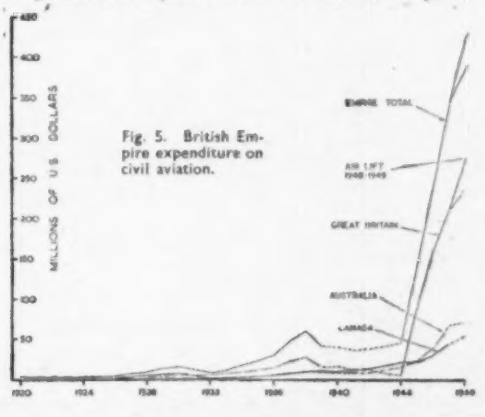

Fig. 5. British Empire expenditure on civil aviation.

Nothing is recorded before 1927, and then only 200 passengers and 11 short-tons of mail; by a rate of expansion comparable with that of other active aeronautical countries these had reached the figures of 358,000 passengers and 50,000 tons of freight by 1940. In the present estimate these two points have been reckoned at $15,000 and $30,000,000 as reflecting the general order of expenditure.

In many countries the increase in government support from about 1934 in its various forms may well have resulted from their first reactions to the German activity on the civil side, as it does to a marked extent later on the military. By the outbreak of the Second World War, world expenditure on civil aviation had reached a total annual figure of 350 million dollars.

During the Second War civil air transport as such diminished in many countries, and many of its functions were taken over by military air-transport services, although in the United States it continued to expand at a considerable rate. In England, also, government money was still appropriated for civil purposes and the B.O.A.C. were running transatlantic and other overseas services. In Europe, Sweden and other neutrals continued their operations, as did also the South American countries. Other countries ceased altogether; hence the gaps in the graphs.

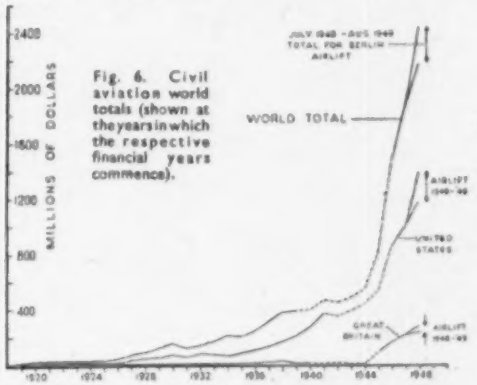

Fig. 6. Civil aviation world totals (shown at the years in which the respective financial years commence).

Since the war the increase of civil aeronautical activity has been meteoric indeed, and in almost every country aircraft operation has leapt forward. From 1946 onwards civil aviation has doubled, trebled and quadrupled its position as compared with that at the beginning of the war, and the rate of expansion showed no sign of slackening until 1948. But here again comes a reminder of the weakness of the yardstick used: in this same period the value of the dollar in terms of labour and material has fallen relatively steeply.

The arithmetical sum of these annual figures gives a result that would be expected from examination of its components, except that there is an apparent drop in 1935, at which point I have ceased to include German figures, other than for the scheduled airlines, and joining up the points of 1933 and 1935 would probably give a truer picture (Fig. 6).

The graph of totals reveals how great is the proportion of world activity due to the United States, and the influence of the Berlin Air Lift is quite noticeable. It displays that from its start after the First World War, expenditure on civil aviation had remained level, or even slightly reduced until 1924, had increased to over 200 million dollars in the next 10 years, and then to 390 million dollars by the outbreak of the war in 1939. By 1949—that is to say by the end of the financial year of 1948, but including the Berlin Air Lift—it had reached the sum total of 2¼ billion dollars (U.S. billions—1,000 millions).

The accumulative totals are no less impressive. By 1932 it was 820 million dollars, by 1939 2,500 millions, and nearly a year short of the present day the total expenditure on civil aviation is assessed at no less than 11½ billion dollars.

Large as these figures are, they shrink to small proportions relatively to the world's expenditure on military aviation.

(To be concluded)

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Case for the Flying-boat

REFERRING to the recent articles and correspondence in your journal concerning the case for the flying-boat, may I add my remarks?

A few weeks ago I had occasion to use B.O.A.C.'s Solent Service to South Africa. What a joy it was! Never have I found air travel so enjoyable. The comfort surpasses that of all landplanes, and there was no feeling of being "closed in." Walking from cabin to cabin, to the bar and upstairs were additional pleasures. True, the Stratocruisers have two decks, but comparison cannot be made. When disembarking at the end of my trip I did feel fresh and not fatigued, as one does on a landplane.

Conversing with the crews, I found that they have great regrets that boats were coming off service.

Concensus of opinion of passengers with whom I travelled was as follows: (a) Flying-boats are the most comfortable type of aircraft to travel in; (b) for choice, boats are preferred even where a landplane service runs on a similar route; (c) that boats give more opportunity to see the country which one is passing through; (d) the amount of time saved in going by landplane instead of by the slower flying-boat is not appreciated, because one's physical condition demands rest at the end of the trip—by boat this is not found necessary.

I feel sure that, with diligent planning and reduction in paper work and its associated staff, flying-boat services might be run at even cost, or perhaps at a small profit.

London, S.W.8. A SATISFIED PASSENGER.

Soviet Air Routes

YOUR correspondent "Airline Historian" (May 18th) is quite correct in saying that detailed information with regard to times, fares, distances, routes, etc., is available concerning civil aviation within the U.S.S.R.

This information in the *A.B.C. World Airways Guide* is quite authentic. Your correspondent also notes that the airliner types are mentioned. I do not wish to disappoint him, or write with any disrespect to the *Guide*, but I must make it clear that the allocations of types (YaK-16, IL-18, etc.) have been made only on the basis of times and distances and known performance characteristics. Only in a very few instances are aircraft types definitely known. Data on Russian aviation has to be pieced together from many sources, and air-route information available in certain sources gives practically everything except aircraft types in use.

There must be many older (and newer) aircraft types in use as well as the Li-2, IL-12, IL-18 and YaK-16, especially on unscheduled short-range routes. The latter would use types such as the Po-2 and ShchE-2, or perhaps YaK-8s. And who knows what might have been left over from pre-war days—even types like the Stal-3, R-5 bis, ANT-9-M-17 etc.?

SOVIET AVIATION HISTORIAN.

Okehamptor, Devon.

Team Aerobatics

GAZING and gaping (as were many others) at the astounding display of formation aerobatics by the French squadron at the R.Ae.S. Garden Party, reported in your issue of May 18th, I found myself wondering why there is no comparable team in the R.A.F. I realize that our Meteor and Vampire aerobatic flights are second to none in their own line; but jet fighters are categorically incapable of providing the particular brand of thrill afforded by manœuvrable, slow, light biplanes of the Stampe/Tiger Moth variety, in the hands of skilled and resolute pilots. In the old Hendon displays, I remember, C.F.S. instructors, flying Moths or Tutors, performed brilliantly; but, whatever the explanation, be it technical or temperamental, we cannot, and never have been able to, hold a candle to the French for intimate, and altogether exceptional, type of show exemplified by the White Waltham performance.

Bravo, France!

London, S.E.11. R. E. M.

Strip-tearing

I AM not sure that the guess of "H. C." (May 18th) as to the origin of the expression "tearing off a strip" is the right answer.

I am inclined to think that it goes back to a theatrical origin (*not* to be confused with strip-*teasing*). The expression "tearing off a strip of calico"—meaning an impolite noise expressive of displeasure—had its origin in an off-stage effect made by tearing a piece of fabric, and was in common use among the "laddies" of the old school. Maybe the B.B.C. Effects Department have some historical data on the point.

London, W.1. STAGE-DOOR JOHNNIE.

POLAR EXPERT

"Hitch Your Wagon—the story of Bernt Balchen," by Clayton Knight and Robert Durham. Bell Publishing Co., Drexel Hill, Penn., U.S.A. Price $3.50.

IN a foreword to this book, Capt. Eddie Rickenbacker writes: "There is no better man in the field of flight than Bernt Balchen. No better man to write about him than Clayton Knight." After reading *Hitch Your Wagon* nobody will disagree with him.

Balchen's introduction to Polar flying was with Amundsen's expedition to the Arctic in 1926. It was there that he met Cdr. Byrd, who was so impressed by the young Norwegian that he asked Bernt to go back to America with him.

The story of Balchen's subsequent experiences as Tony Fokker's test pilot at Teterboro and as a Canadian "bush-flyer" are followed by chapters describing his epic flights with Byrd, across the Atlantic in the Fokker monoplane *America* and over the South Pole in the Ford *Floyd Bennett*. The authors have captured the full drama of the moment when the Ford, overloaded with fuel, scraped over a pass in the Antarctic mountain barrier on its way to the Pole, with inches to spare and only after much of the crew's food supply had been dumped overboard. Their descriptions of the terrifying Polar terrain are masterpieces of prose.

Balchen's second Antarctic expedition, with Ellsworth, further established his reputation as the top-rank Polar bad-weather pilot of all time. He was, therefore, an obvious choice soon afterwards for the job of helping Hjalmar Riiser-Larsen to establish Norwegian Airlines and pave the way for the S.A.S. combine, although by then a naturalized American. But this comparatively quiet interlude did not last long, and World War Two took him back to active flying and further hardship and adventure, first as commander of a U.S.A.A.F. rescue base in Greenland and then with U.S. Special Service air units in Scandinavia.

To-day, an incomparable expert on "Polar strategy," he is back with the U.S.A.F., as commander of its 10th Rescue Squadron in Alaska, after a post-war spell with D.N.L. *Hitch Your Wagon* is, therefore, not the end of the story, but it is a superb beginning.

FORTHCOMING EVENTS

June	2-4.	Tyrol Rally, Innsbruck.
June	3.	Derby Aero Club : "At Home" and Display.
June	3-4.	"Wines of Anjou" Rally, Angers.
June	3-4.	Ultra Light Aircraft Association : Rally, Fairwood Common.
June	4.	F.A.I. : General Conference, Stockholm.
June	4.	Aero Club of Normandy : Aerobatic Competition.
June	4.	Ragosine Trophy Navigation Competition, Rearsby.
June	10.	Aero Golfing Society : Match v. A. and A.E.E., Boscombe Down.
June	10.	Blackpool and Fylde Aero Club : "At Home."
June	10.	Darlington Flying Display.
June	10-25.	Brussels International Aeronautical Exhibition.
June	11.	Fête Aérienne d'Orly, Paris.
June	15-18.	Benelux Air Tour.
June	16.	Institute of Navigation : "A Survey Flight to South Africa," by J. L. Cowan ; "Light-aircraft Navigation," by Michael Townsend.
June	16-19.	Aero Club de Roussillon : Perpignan Rally.
June	17-18.	Normandy Rally.
June	17.	Wolverhampton Aero Club : King's Cup Race.
June	18.	Wolverhampton Aero Club : Goodyear Trophy Race.
June	23.	Institute of Navigation : "Aeronautical Charts," by T. St. Barbe Freer.
June	24-26.	Le Touquet Rally.
July	1-3.	R.Ae.C. : Members' Deauville Rally.
July	2.	Northern Heights Model Flying Club : Gala Day, Langley Airfield.
July	2-9.	Aero Club of Italy : International Air Week.
July	3-16.	Aero Club of Sweden : International Gliding Contests, Orebro.
July	7-8.	Royal Air Force Display, Farnborough.
July	8.	Wiltshire Flying Club : "At Home."
July	8-10.	R.Ae.C. : Members' La Baule Rally.
July	14-16.	Cognac International Rally.

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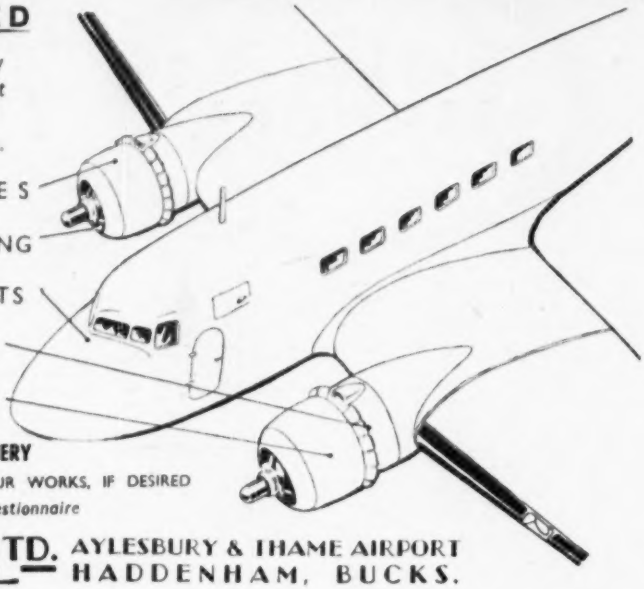

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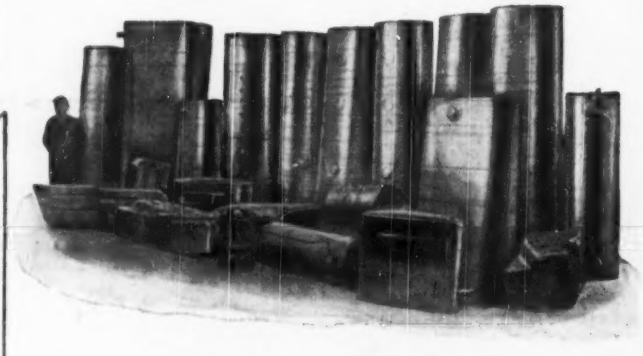

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It is roughly 500 miles square and has two towns, both populated by executives and employees of mining and trading companies. There are no railways and few roads. The interior, where large mineral deposits are situated, is rocky and well wooded, with a number of lakes and rivers. It lies off the trunk air routes and has to be served by feeder airline to the mainland.

Shorts have designed the Sealand for all areas in which the conditions of this island are repeated, and similar enterprises are considered.

The Sealand has proved itself a thoroughly economical proposition, for it carries 8 passengers, or 6 passengers with their baggage and 80 lb. of freight, to and from the island, travelling over 300-mile stretches of sea at an average speed of 127 m.p.h.

As a freighter it carries 1,000 lb. for a distance of nearly 700 statute miles without having to strip any of the furnishings to accommodate this load.

Private companies, with extensive interests in the agricultural and fishing industries of the island, find the Sealand incomparable for accelerating the development of their enterprises; where fleets of trawlers are operating they are easily controlled from the air while at sea.

Crop spraying and dusting, forest fire patrol, and personnel transport are all within its range of duties. In fact, the general manager's office can be taken right into the heart of the plantation or the fishing ground.

For rocky and difficult interior country, where the going is hard, the Sealand once again is indispensable. Lakes and rivers can be used as landing places for flying in new equipment, stores, and personnel; geological and geographical surveys and mineral prospecting can easily be undertaken, while in an emergency it is quickly converted into a comfortable and speedy air ambulance.

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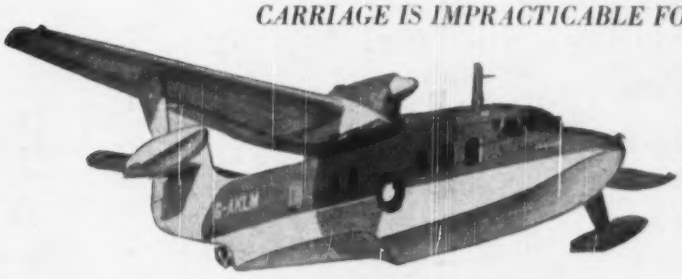

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DH.5220.P	Gipsy Major 1	DH.82 (Tiger Moth) DH.82A (Tiger Moth Trainer).
DH.5220.H	Gipsy Major 1	As above and DH.83 (Fox Moth), DH.84 (Dragon).
DH.5232.A	Gipsy Major 1	DH.84 (Dragon), DH.85 (Leopard), DH.82A (Tiger Moth Trainer), DH.90A (Pust Moth), DH.83 (Fox Moth).
DH.5234.J	Gipsy Major 1	DH.87B (Hornet), DH.85 (Leopard).
DH.5250.B	Gipsy Major 1	DH.90A (Dragonfly).
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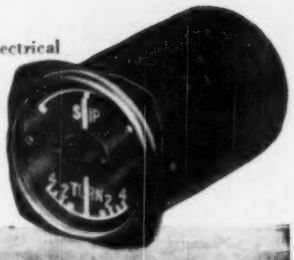

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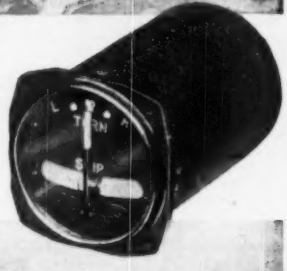

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SERVICE AVIATION

Royal Air Force and Naval Aviation News and Announcements

Graduation at Halton

AT No. 1 School of Technical Training, Halton, the passing-out parade of the 56th Entry of aircraft apprentices was held on May 23rd. Consisting of 232 apprentices, the entry was the largest to graduate from Halton since the war. The reviewing officer was Air Marshal Sir Hugh P. Lloyd, K.B.E., C.B., M.C., D.F.C., the A.O.C.-in-C., Bomber Command, and he was accompanied by Air Marshal Sir John Whitworth Jones, K.C.B., C.B.E., A.O.C.-in-C., Technical Training Command.

Making his report, the Commandant, A. Cdre. N. Carter, C.B., D.F.C., stated that the entry had been given technical training in modern equipment which included jet aircraft and gas turbines, together with their associated accessories in the armament, electrical and instrument fields. As a result, they were well up with present-day technical developments and should have no difficulty, after a little practical experience, in servicing the most modern types of aircraft. Members of the entry had received a total of 400 hours' air experience, and 77 per cent of them had volunteered for aircrew duties.

Winners of the various prizes and awards were as follows:—

Merit in all subjects ...	Sgt/App. H. J. Pooley.
Merit in general service efficiency	Sgt/App. J. H. Hughes.
Merit in educational subjects	Cpl/App. A. J. Noon.
Merit in C.T.T.B. practical fitting tests and Crabbin Robinson cup ...	Cpl/App. K. R. Edgeley.
Highest average for practical fitting over 3 years' course	Ldg/App. P. G. Harknett.
Merit in general studies and winner of Elliott Memorial Prize, presented by R.Ae.S. ...	Cpl/App. M. J. Armitage.

"Flight" photograph.

PASSING-OUT PARADE: Members of the 56th Entry are inspected during the largest post-war passing-out parade at Halton, which is reported on this page.

Best Tradesman in C.T.T.B. Examination

Fitter IIE	Ldg/App. K. F. Greaves.
Fitter IIA	Sgt/App. H. J. Pooley.
Electrician	F/Sgt/App. G. J. Osborne.
Instrument maker ...	Sgt/App. O. R. Vickers.
Fitter Armourer ...	Cpl/App. K. R. Edgeley.

Commandant's Special Commendation

Electrician	F/Sgt/App. G. J. Osborne.

Sir Thomas Elmhirst Retires

AIR MARSHAL SIR THOMAS ELMHIRST, K.B.E., C.B., A.F.C., whose last appointment was as Chief of Air Staff and Commander-in-Chief, Royal Indian Air Force, which he relinquished in February, is now on leave pending retirement from the R.A.F.

Born in 1895, Air Marshal Elmhirst joined the Royal Naval College, Osborne, in 1908, went to sea as a midshipman in 1913, and when the first world war began was serving in H.M.S. *Indomitable*, in which ship he took part in the pursuit of the German cruisers *Goeben* and *Breslau* in the Mediterranean and the battle of the Dogger Bank. He was in the R.N.A.S. as a captain of airships from 1915 until the formation of the R.A.F. Between wars he specialised in air navigation, qualified at the Staff College, and commanded No. 15 Bomber Squadron. He was capped as scrum half in the R.A.F. XV of 1921!

From February, 1937, until April, 1939, he was air attaché at Ankara and he was again in Turkey for a few months early in 1941 as a member of the British mission for staff conversations with the Turkish General Staff. In the interval he had commanded the R.A.F. Stations at Leconfield and Abingdon and served at the Air Ministry of a Deputy Director of Intelligence and at H.Q., Fighter Command, during the Battle of Britain as a Deputy Senior Air Staff Officer.

Sir Thomas was, in the latter stages of the war, Chief of Administration of the 2nd T.A.F. in Europe, having spent some time on similar duties in North

"Flight" photographs.

MARCH-PAST: At the saluting base (left) are G.C. Rutter; Air Marshal Whitworth Jones, C.-in.-C., Technical Training Command; A. Cdre. Carter; W.C. Biggs; Air Marshal Sir Hugh P. Lloyd, Reviewing Officer, C.-in.-C Bomber Command; and A. V-M. R.O. Jones, A.O.C. 24 Group. On the right Sir Hugh Lloyd congratulates the chief prizewinner, Sgt App. Feeley.

SERVICE AVIATION . . .

Africa, first with the Desert Air Force and later with the N.W. African T.A.F.

After the war he was at the Air Ministry as Assistant Chief of the Air Staff (Intelligence) until early in 1947, when he went to India to be Chief of Inter-Service Administration in the period before India assumed her Dominion status, after which he became Commander-in-Chief of the R.I.A.F.

W.R.A.F. Appointments

THE following Women's Royal Air Force appointments are announced by the Air Ministry: Group Officer Lady Seton, O.B.E., to be Deputy Director W.R.A.F.; Wing Officer A. M. Muir to be W.R.A.F. Staff Officer, British Air Forces of Occupation, Germany, with the acting rank of Group Officer; Wing Officer L. H. Turner, O.B.E., to be Inspector of W.R.A.F. with the acting rank of Group Officer.

G/O. Lady Seton enlisted in 1939, her first posting being to Headquarters, No. 24 Group. She later held appointments as W.A.A.F. Staff Officer at Group Headquarters in England and Scotland. For over two years she was W.A.A.F. Staff Officer to the Air Member for Supply and Organization. This was followed by six months in the W.A.A.F. Directorate dealing with personnel questions. For the last 18 months she has been Inspector of the W.R.A.F.

Wg/O. Audrey M. Muir also enlisted in the W.A.A.F. in 1939. At the outbreak of war she was trained as a code and cypher officer and served in that capacity at home and in the Middle East for three and a half years. Wg/O. Louise H. Turner originally enlisted as an M.T. driver. Commissioned in 1940, she served as a W.A.A.F. Administrative Officer on various R.A.F. stations.

R.A.F. Display Posters

THERE were 97 entrants—and a total of 126 designs—in a recent competition held by the Air Ministry to select posters advertising the R.A.F. Display. The competitors were all members of the R.A.F. or Air Ministry employees.

The winning poster was produced by F/O. A. Appleby, an undergraduate and member of Durham University Air Squadron. A second design, by Mr. Groves of the Air Ministry, was also adopted.

New Instrument Ticket

AS a new step towards the creation of an all-weather air force, a third type of instrument-rating card—the "master green"—is being introduced in the R.A.F., in addition to the green and white tickets already in use. The new cards, denoting all-weather pilots, will not be awarded before completion of 2,000 hours' flying or—in the case of fighter pilots—the holding of a green rating for five consecutive years.

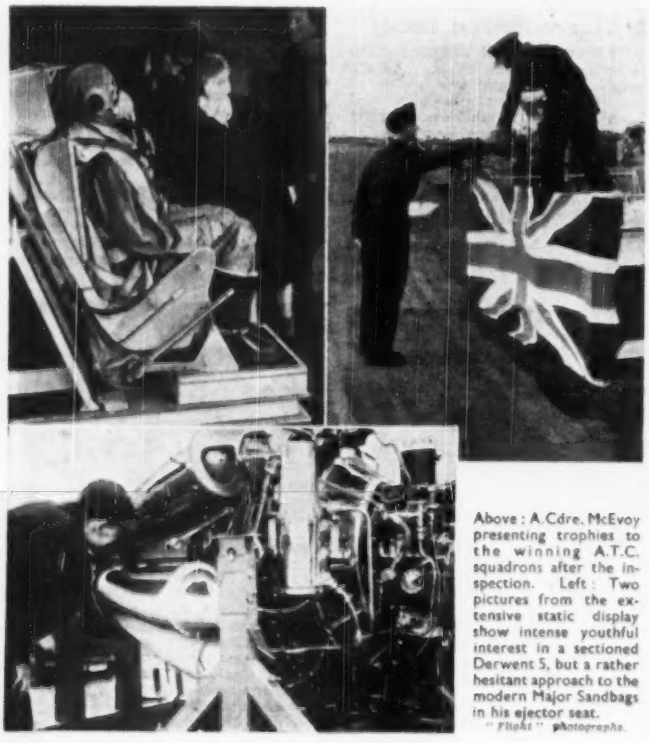
Raising R.A.F. Reserve Strength

NATIONAL Servicemen who entered the R.A.F. on or after January 1st, 1949, are liable for 18 months' full-time service, followed by four years' part-time duty with the R.Aux.A.F., R.A.F.V.R. or class "H" reserve. As from the beginning of next July, therefore, the R.A.F. reserves will receive a steady flow of trained personnel which should help to alleviate the present shortage. Volunteers, of course, will still be needed.

The Air Ministry has outlined the conditions under which released National Servicemen may fulfil their further liabilities. Those who have received pilot training will continue to receive instruction as part-time members of Auxiliary fighter squadrons on Reserve Flying Schools. Many will be granted commissions. Men who have received N.S. ground-branch commissions will likewise continue their service in the R.Aux.A.F. or R.A.F.V.R.

Groundcrews and other non-flying airmen will be given a booklet explaining their obligations in Auxiliary or V.R. ground trades, and setting out details of pay, bounties and allowances for which they will be eligible. For tradesmen, alternatives to Auxiliary or V.R. service will be four years on the R.A.F. "H" reserve—demanding up to 60 days' training in that period—or instructional duty with the A.T.C. as officers or Warrant Officers.

KENLEY OPEN DAY and SURREY WING A.T.C. RALLY



Above: A.Cdre. McEvoy presenting trophies to the winning A.T.C. squadrons after the inspection. Left: Two pictures from the extensive static display show intense youthful interest in a sectioned Derwent 5, but a rather hesitant approach to the modern Major Sandbags in his ejector seat.

"Flight" photographs.

AS have so many open-air events this spring, Kenley's Open Day suffered badly from inclement weather. A cold wind was blowing and the cloud ceiling was less than 300ft above the runways.

It proved almost impossible for visiting high-speed aircraft to approach the airfield, which is on top of a hill.

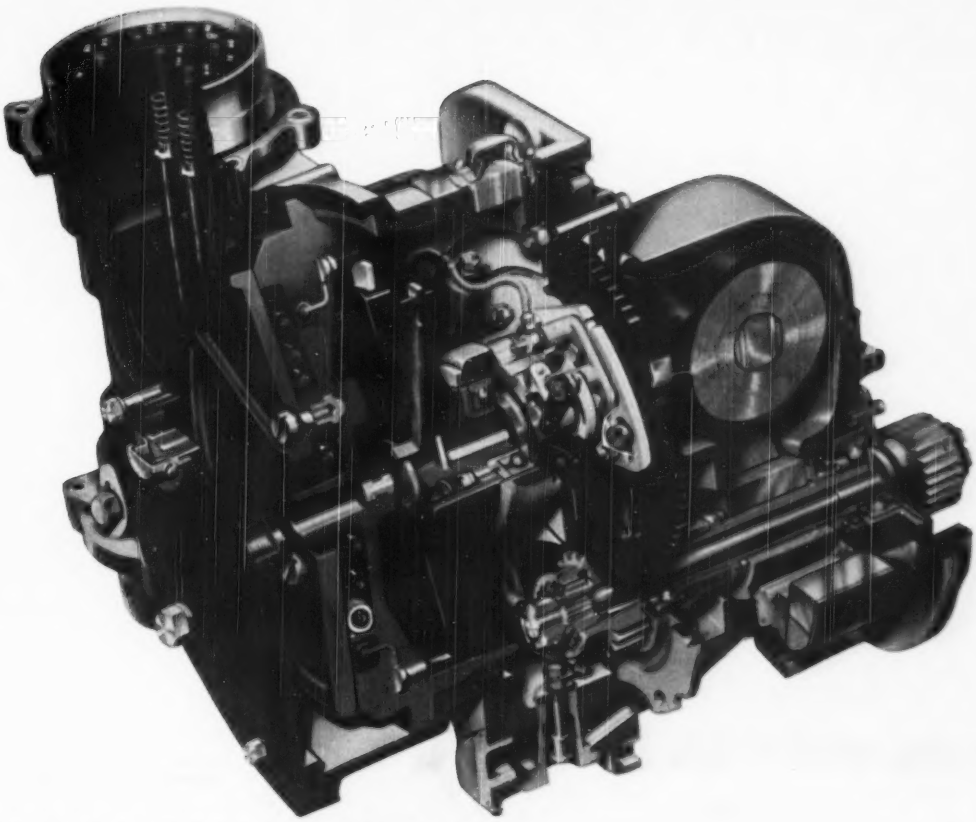
All credit is due to the pilots of a Spitfire from No. 615 (County of Surrey) Sqn., R.Aux.A.F., and a Meteor 4 who, alone among intended visitors, managed to arrive. They had no space for manœuvring. The Spit. contented itself with tight turns over the airfield, while the Meteor made one high-speed pass, with little grey fluffs of compression condensation continually appearing over the wing, and then disappeared into the distance, sensibly returning home.

The "home" aircraft did rather more, if not so quickly. Crazy flying and Col. Crackshot on Tiger Moths remain ever popular, and a demonstration of the Auster A.O.P. by an Army pilot was most emotioning.

A. Cdre. T. N. McEvoy, C.B.E., A.O.C. No. 61 (ER) Group, took the salute at the march past of the Surrey Wing of the A.T.C., of which 27 squadrons out of a total of 30 were represented. In a message, he recalled that the Surrey Wing had won the boxing, football and rugby inter-county trophies and had entered more cadets into the R.A.F. than any other wing.

The Air Commodore also mentioned that Croydon had supplied more people for the Air Force than any other town of its size in England; and that it was beaten in total numbers only by Birmingham and Glasgow.

At the moment one of Croydon's three A.T.C. squadrons, No. 97, is under notice to leave its present premises and unless a site can be found for three huts the unit will have to be disbanded.



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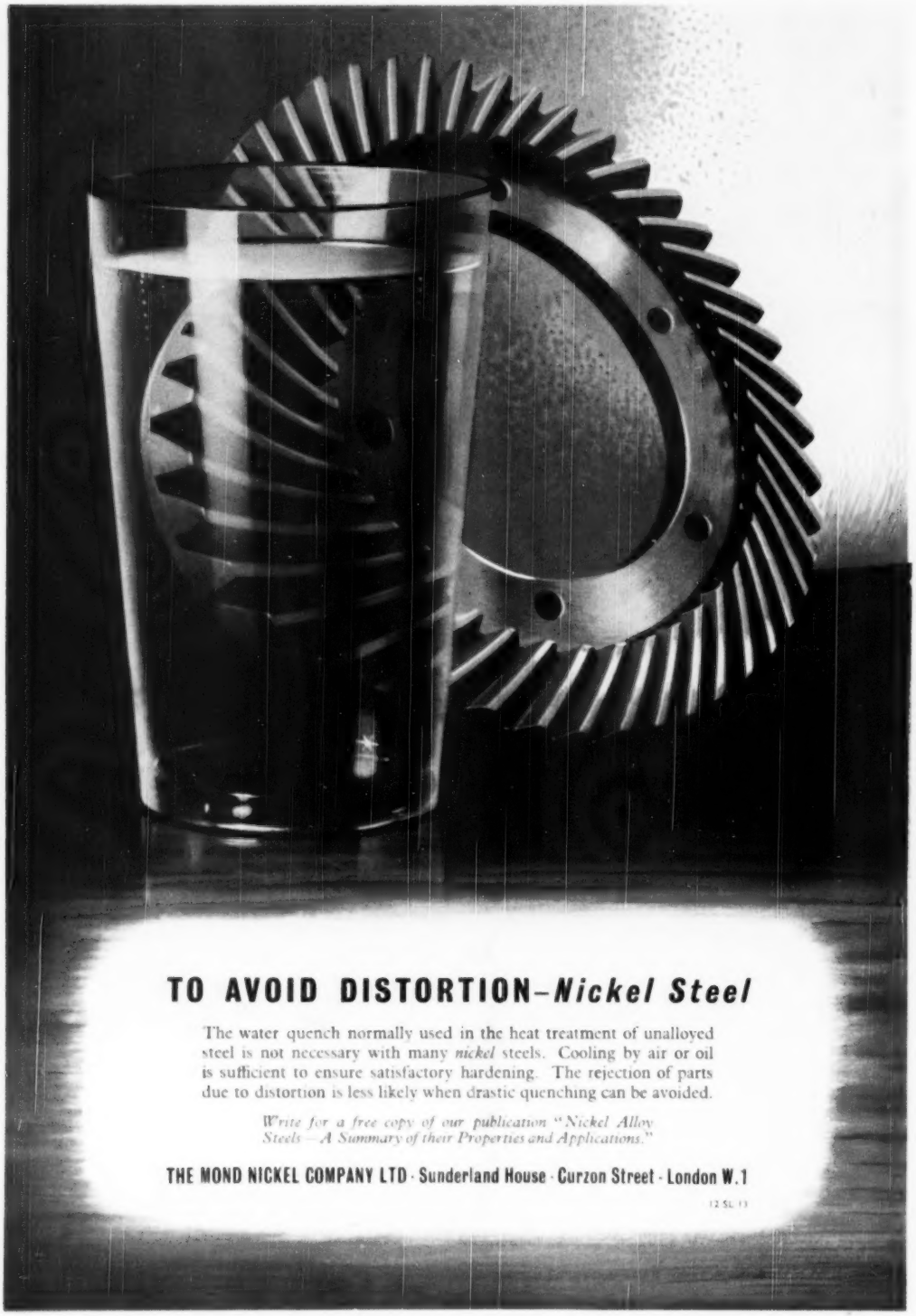
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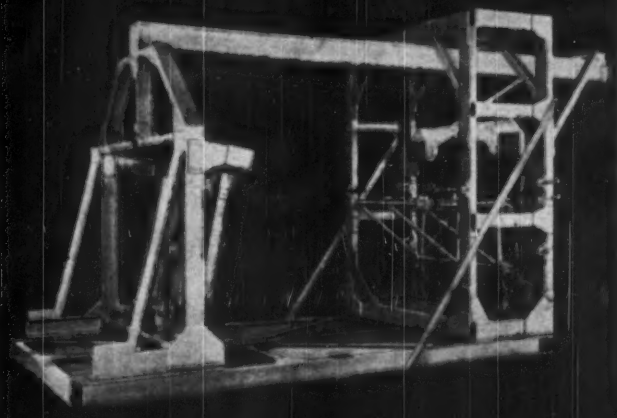

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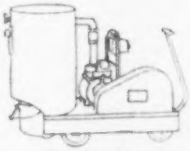

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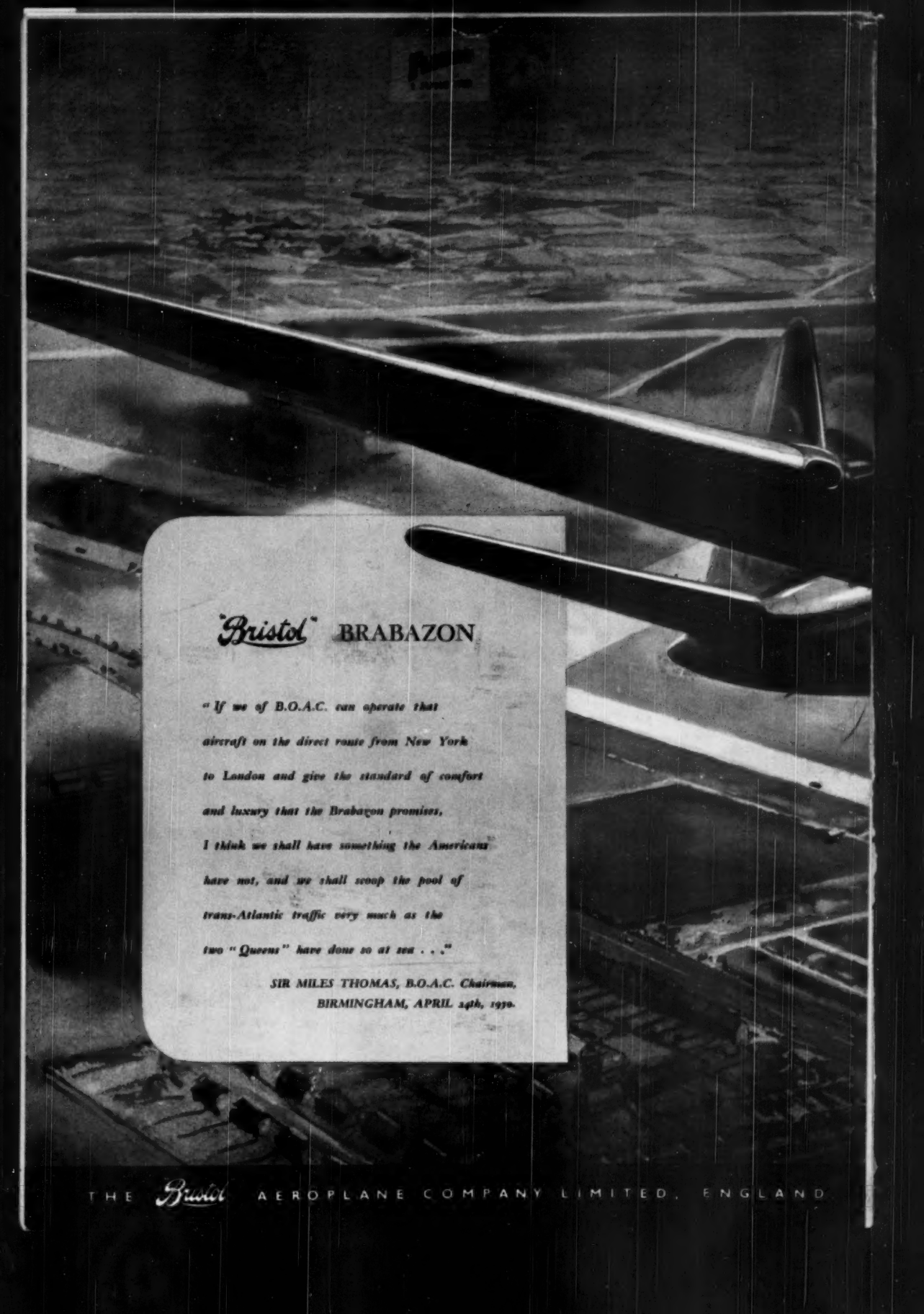

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